31-01-01

Charging System

GROUP 31

	PAGE
PART 31-01	
General Charging System Service	31-01-01
PART 31-02	
Autolite Alternators	31-02-01
PART 31-03	
Autolite Alternator Regulators	31-03-01
PART 31-04	
Leece-Neville Alternators	31-04-01
PART 31-05	
Leece-Neville Alternator Regulators	31-05-01
PART 31-06	
Batteries	31-06-01

PART 31-01 *General Charging System Service*

The alternator and alternator regulator are precision built units, and the equipment to make tests in the charging system must be accurate. Voltmeters must be accurate within 0.1 (one tenth) volt within the range of 12 to 16 volts and ammeters within one ampere at 30 to 65 amperes to permit correct measurement of the alternator and regulator. The meters on Rotunda equipment should be calibrated once a year and the date of calibration stamped on the meter face. It is recommended that this practice be followed by technicians with other than approved equipment in order to maintain their meters at acceptable accuracy.

Certain tests outlined in this section are illustrated in schematic and in pictorial form. The schematic illustrates the internal connections of the Rotunda equipment so that these connections can be duplicated when this equipment is not available. The Rotunda test units are a combination of accepted instruments incorporated into a single unit. The various circuits involved in the tests can be selected by means of switches without the necessity of changing connections. As a result, the time required to test units and circuits on the vehicle is reduced.

Where applicable, the tests are divided into On The Vehicle and On The Test Bench procedures. Either procedure can be followed depending on the equipment available for the tests.

Trouble shooting or diagnosis is required before actual repairs are made in the electrical system. Even where an obvious fault makes the replacement of a unit necessary, you must still find out why the unit failed. The trouble shooting procedures given in the Electrical Systems Diagnosis Manual will aid you in making a correct diagnosis. When a trouble is diagnosed correctly, unnecessary repairs are prevented, the time the vehicle is out of service will be decreased, and the repairs that are made will be permanent.

Schematic wiring diagrams (Figs. 1, 2 and 3 Parts 31-02 and 03) of the charging circuits show the internal connections and windings of the various units. Color codes are shown to aid in tracing the circuit.

PART 31-02 Autolite Alternators

COMPONENT INDEX Applies to Models As Indicated	All Models	Ford	Mercury	Meteor	Cougar	Fairlane	Falcon	Maverick	Montego	Mustang	Lincoln-Continental	Thunderbird	Continental-Mark III
ADJUSTMENT—BELT, ALL MODELS	02-10												
DESCRIPTION AND OPERATION													
All Alternators	02-01												
Fuse Link	02-16												
DISASSEMBLY AND OVERHAUL													
38-Ampere Alternator		N/A	N/A	N/A	N/A	02-11	02-11	02-11	02-11	02-11	N/A	N/A	N/A
42-Ampere Alternator		02-11	02-11	02-11	02-11	02-11	02-11	02-11	02-11	02-11	N/A	N/A	N/A
55-Ampere Alternator		02-11	02-11	02-11	02-11	02-11	N/A	N/A	02-11	02-11	N/A	N/A	N/A
55-Ampere Alternator With Integral Voltage Regulator		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	02-11	02-11	02-11
65-Ampere Alternator		02-14	02-14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	02-14	02-14	02-14
REMOVAL AND INSTALLATION													
All Alternators	02-10												
Fuse Link	02-16												
SPECIFICATIONS	02-17												
TESTING													
Fuse Link	02-16												
With Rotunda (ARE 20-22) Tester	02-02												
With Rotunda (ARE 27-38) Tester	02-03												
Diode Test	02-09												
Field Open or Short Circuit Test	02-08												
Stator Open or Grounded Circuit Tests	02-09												
Stator Neutral Voltage Test	02-07												
Output Test	02-03												

A page number indicates that the item is for the vehicle listed at the head of the column.
N/A indicates that the item is not applicable to the vehicle listed.

1 DESCRIPTION AND OPERATION

The alternator charging system is a negative (-) ground system, and consists of an alternator, a regulator, a charge indicator, a storage battery and associated wiring. Refer to Wiring Diagram Manual Form 7795-P-70 for schematics and locations of wiring harnesses.

ALTERNATOR

The alternator is belt driven from the engine. Current is supplied from the alternator-regulator system to the rotating field of the alternator through two brushes to two slip rings.

The alternator produces power in the form of alternating current. The alternating current is rectified to direct current by six diodes for use in charging the battery and supplying power to the electrical system. The alternator is self current limiting.

Figs. 1, 2 and 3 show the alternator system schematics.

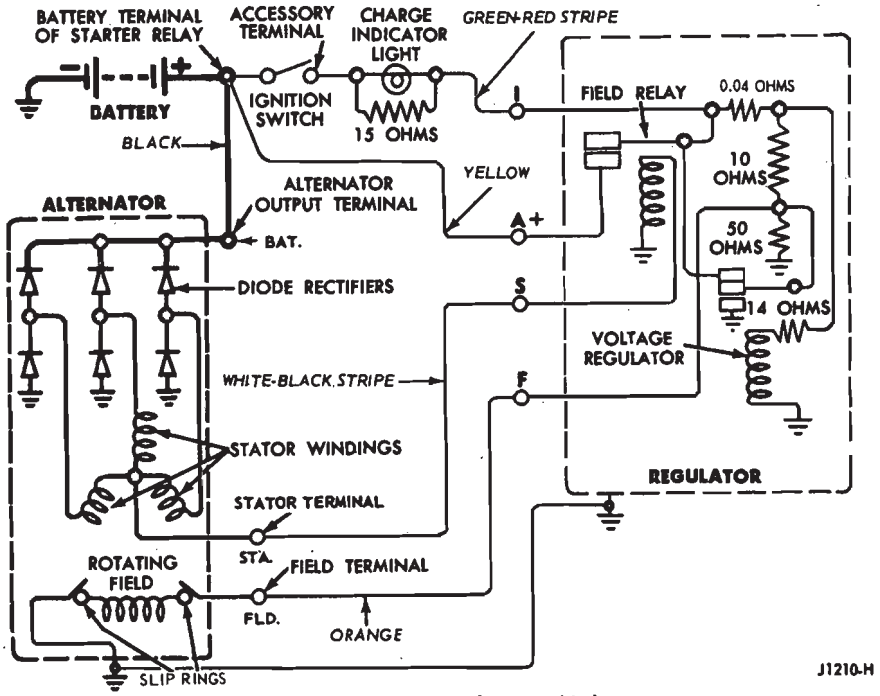


FIG. 1—Autolite Alternator System—Indicator Light

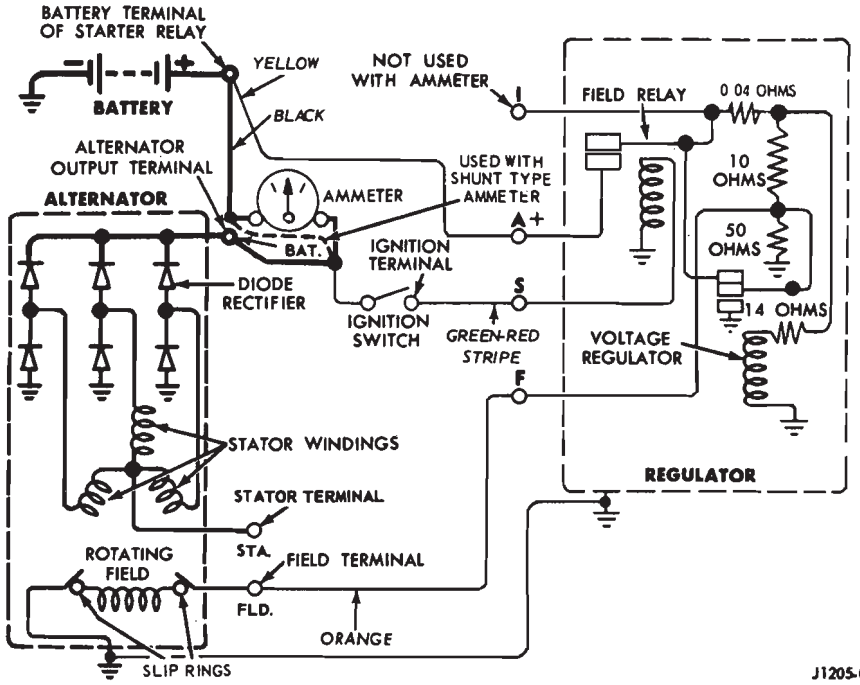


FIG. 2—Autolite Alternator System—Ammeter

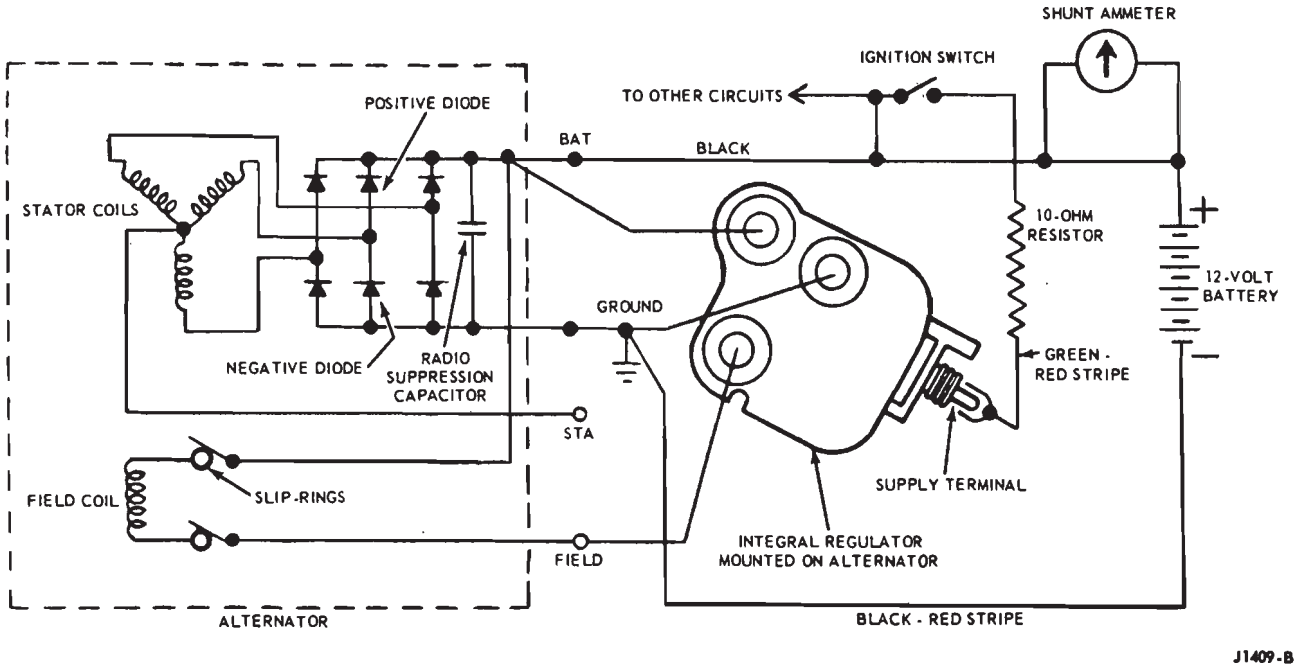


FIG. 3—Autolite Alternator System—With Integral Regulator

2 AUTOLITE ALTERNATOR TESTING

Refer to the Ford Car and Truck Diagnosis Manual for diagnosis of the Autolite alternator system.

Check the alternator drive belt and adjust it to specification (Section 7 in this part), before proceeding with any tests. Check and tighten all connectors at the starter relay and battery.

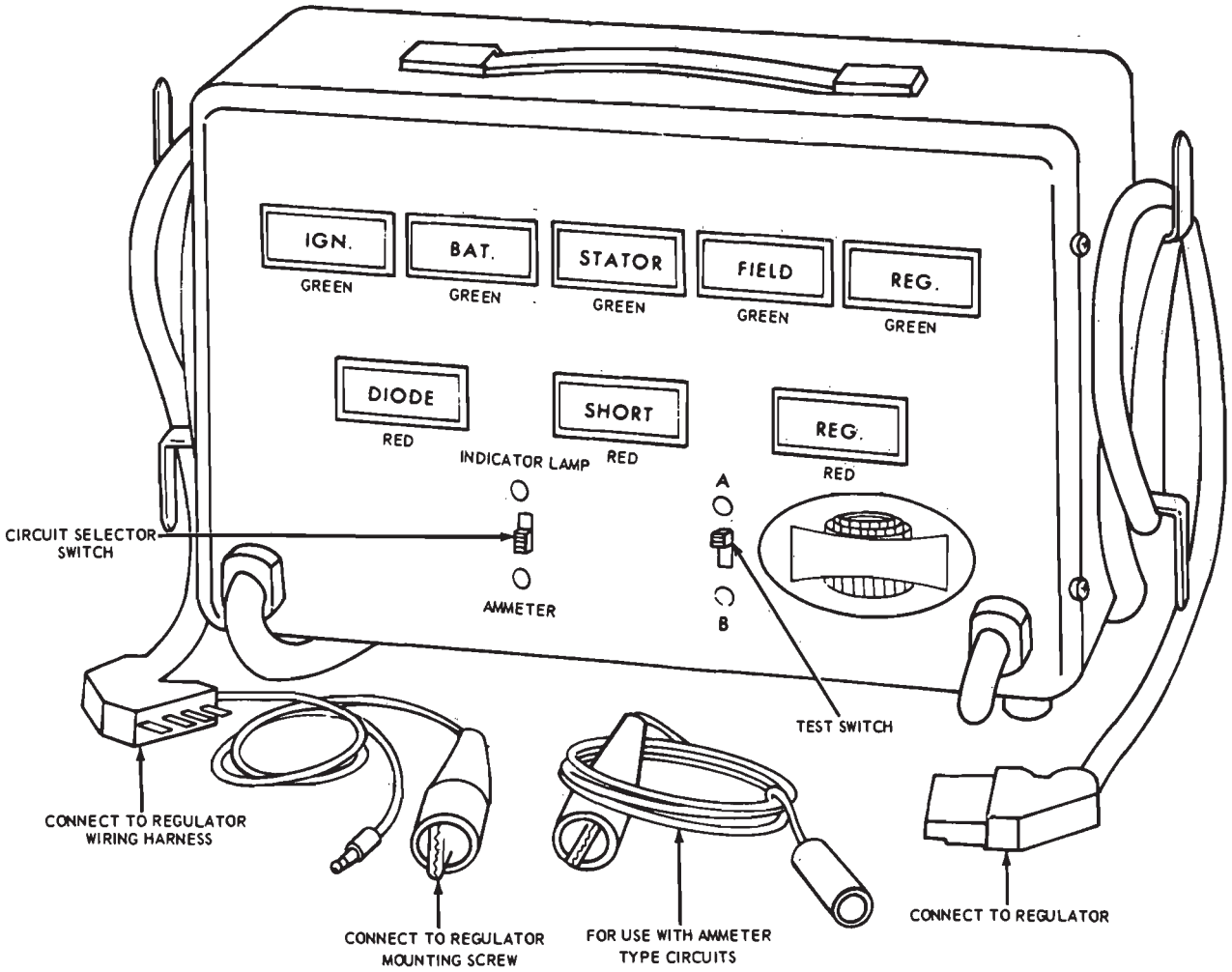


FIG. 4—ARE 20-22 Tester

TESTS USING THE ROTUNDA ARE 20-22 ALTERNATOR REGULATOR TESTER

The general procedure is to connect the tester (Fig. 4), to the charging system, start the engine, make two tests, and then compare the pattern of lights that appear on the tester to each set of patterns shown on two charts (Figs. 5 and 6). Follow the instructions given with the ARE 20-22 tester. **The ARE 20-22 tester cannot be used to test the alternator with the integral regulator.**

TESTS USING THE ROTUNDA ARE 27-38 VOLT-AMP-ALTERNATOR TESTER

The following test procedures make use of the Rotunda Volt Amp-Alternator Tester ARE 27-38.

Refer to Wiring Diagram Manual Form 7795-P-70 for schematics and locations of wiring harnesses. **Use care when connecting any test equipment to the alternator system, as the alternator output terminal is connected to the battery at all times.**

ALTERNATOR OUTPUT TEST ON ENGINE

When the alternator output test is conducted off the car, a test bench must be used. Follow the procedure given by the test bench equipment manufacturer. **When the alternator is removed from the vehicle for this purpose always disconnect the battery ground cable as the alternator output connector is connected to the battery at all times.**

To test the output of the alternator on the vehicle, proceed as follows:

Alternators Without An Integral Regulator

1. Check the alternator drive belt tension. Place the transmission in neutral or park **and apply the parking brake.** Make the connections and tester knob adjustments as shown in Fig. 7 Output Test. Be sure that the field rheostat knob is at the OFF position at the start of this test.
2. Close the battery adapter switch. Start the engine, then open the battery adapter switch.
3. Increase the engine speed to approximately 2000 rpm (use a tachom-

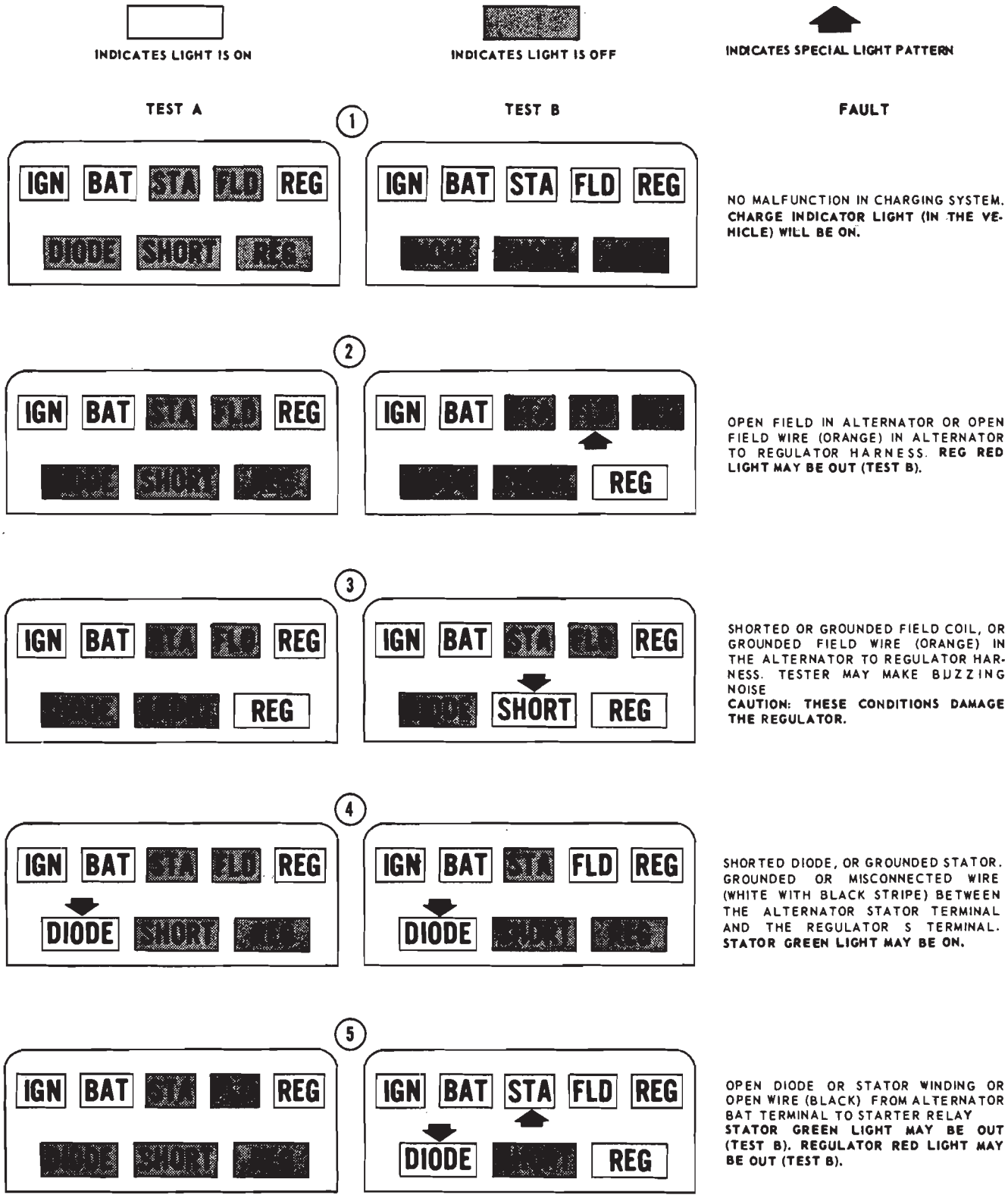
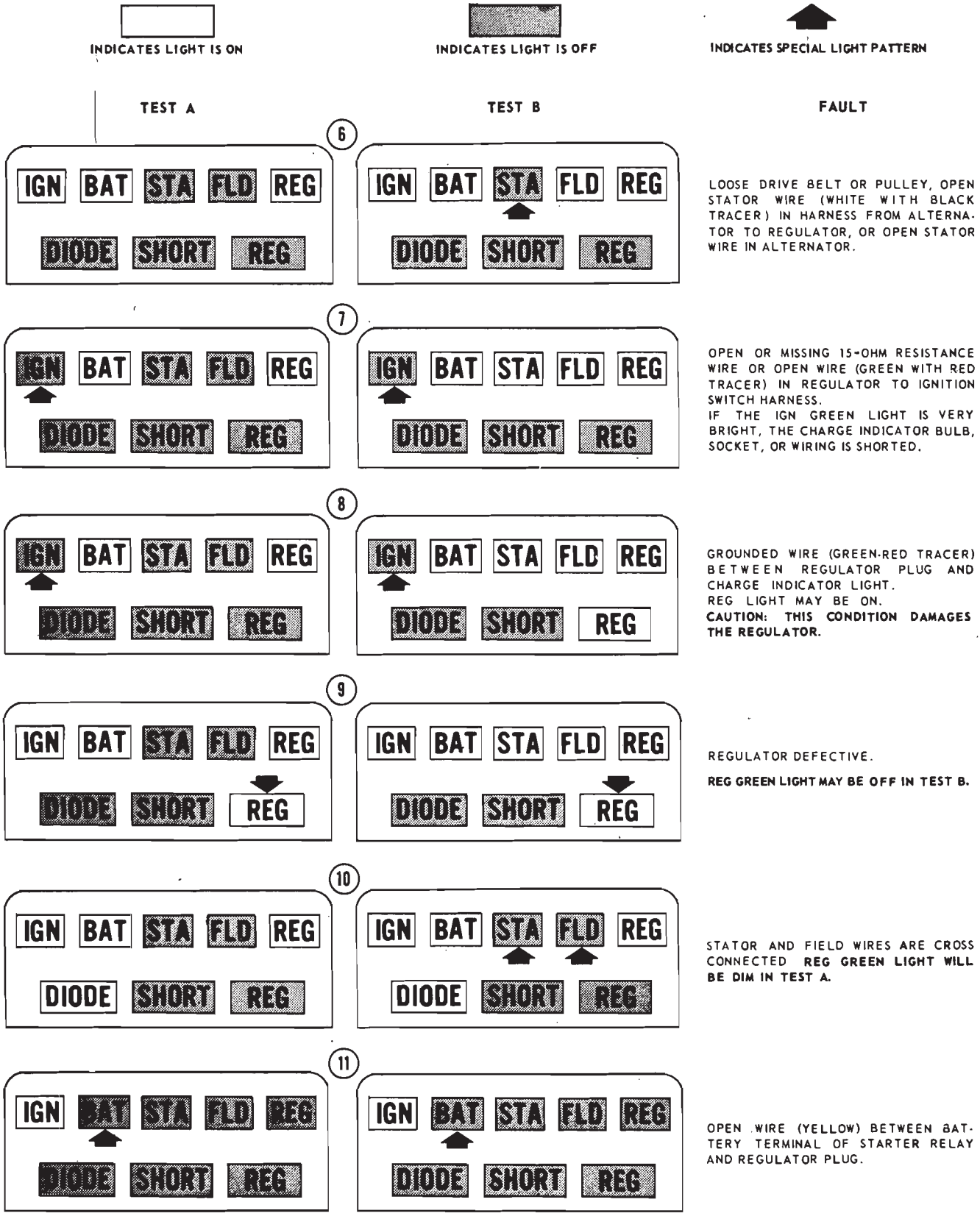


FIG. 5—ARE 20-22 Test Chart



NOTE: ALWAYS REPAIR MALFUNCTION AND RETEST

J1400-C

FIG. 6—ARE 20-22 Test Chart (Continued)

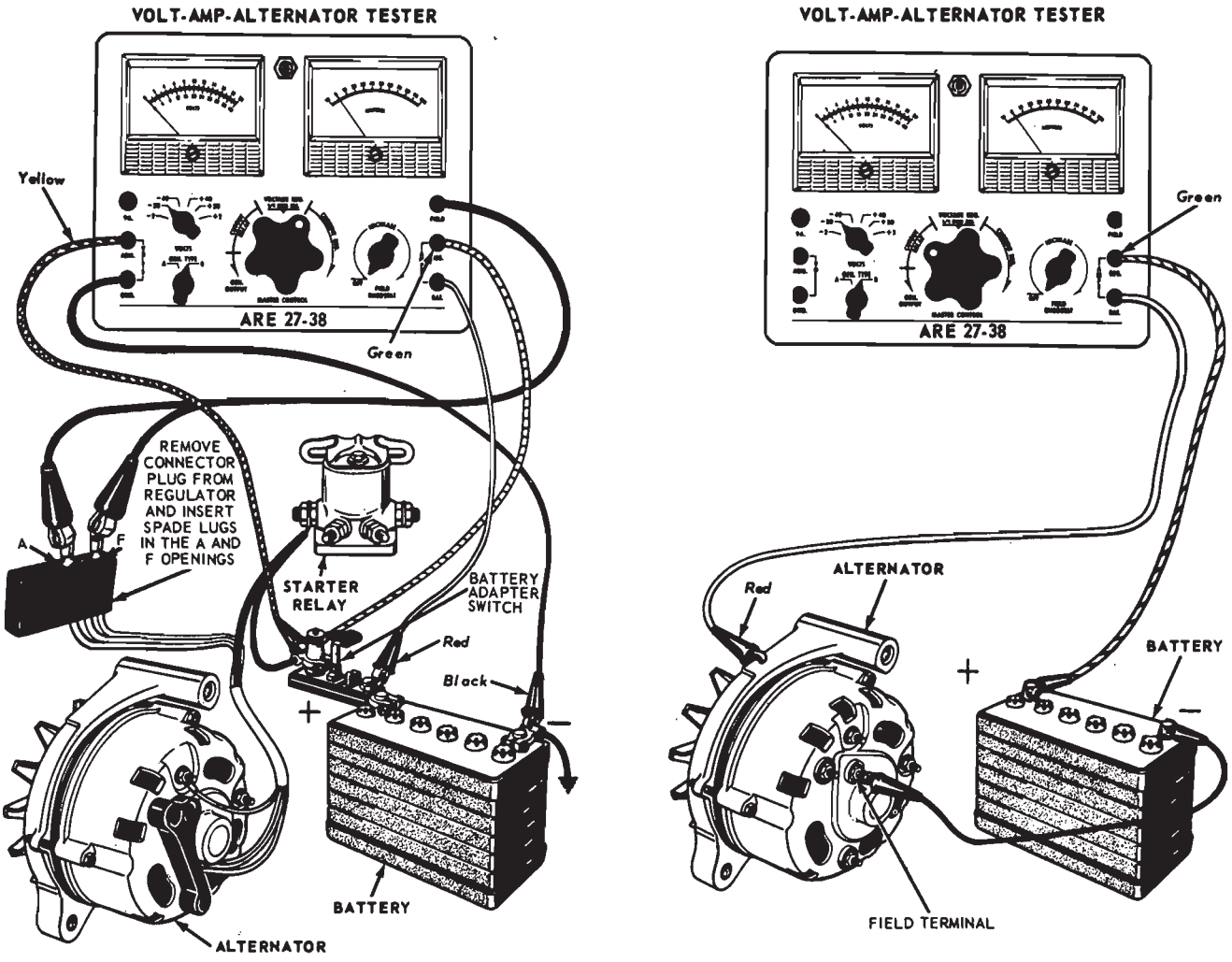


FIG. 7—Alternator Tests—Except With Integral Regulator

eter Part 9-1, Section 1). Turn off all lights and electrical accessories.

4. Turn the field rheostat clockwise until 15 volts is indicated on the voltmeter upper scale. Turn the master control clockwise until the voltmeter indicates between 11 and 12 volts. Holding the master control in this position turn the field rheostat clockwise to its maximum rotation. Turn the master control counterclockwise until the voltmeter indicates 15 volts. Observe the ammeter reading. Add 2 amperes to this reading to obtain alternator output. If rated output (Section 7 in this part), cannot be obtained, increase the engine speed to 2900 rpm and repeat this step.

5. Return the field rheostat knob to OFF, release the master control knob, and stop the engine. Disconnect the test equipment, if no further tests are to be made.

If the alternator output is not O.K., it will be necessary to remove the alternator from the vehicle and perform the necessary bench tests to locate the defect.

An output of 2 to 5 amperes below specifications usually indicates an open alternator diode. An output of approximately 10 amperes below specifications usually indicates a shorted alternator diode. An alternator with a shorted diode will usually whine, which will be most noticeable at idle speeds.

Alternators With An Integral Regulator

Use care when connecting the test equipment to the alternator as the alternator output terminal is connected to the battery at all times. Under no circumstances should the regulator battery terminal be connected to the regulator field terminal. To do so will permanently damage the regulator.

1. Check the alternator drive belt tension. Place the transmission in neutral or park and **apply the parking brake.** Make the tester connections as shown in Fig. 8, Alternator Output Test. Connect the jumper wire as shown. Be sure that it is securely clipped to the regulator field terminal.

2. Close the battery adapter switch. Start the engine, then open the battery adapter switch.

3. Increase the engine speed to approximately 2000 rpm. Turn off all lights and electrical accessories.

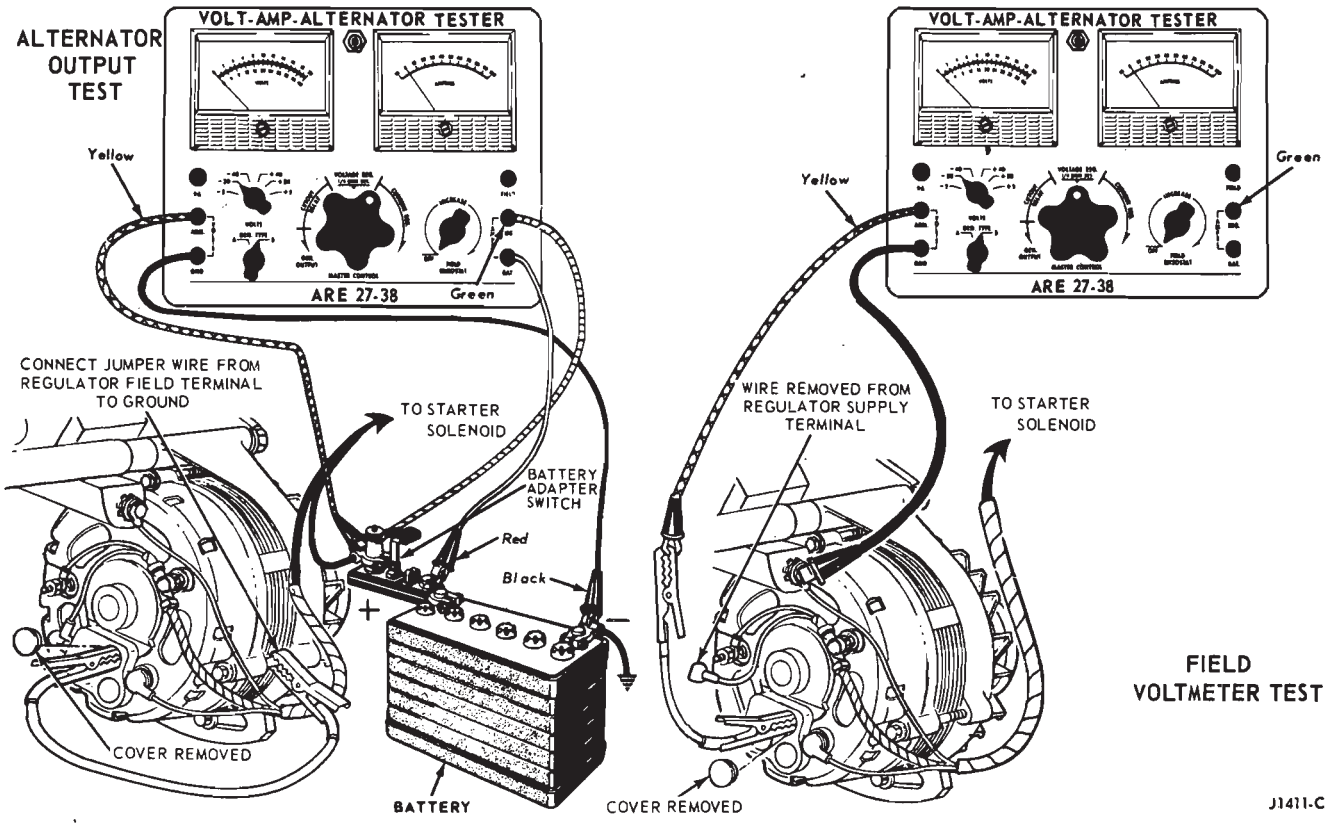


FIG. 8—Alternator Tests—With Integral Regulator

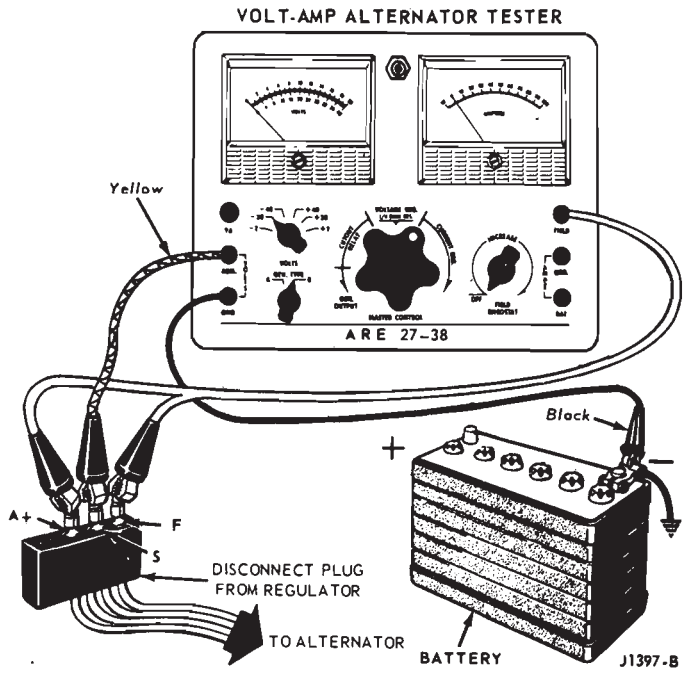


FIG. 9—Autolite Stator Neutral Voltage Test

4. Turn the master control clockwise until the voltmeter on the tester indicates 15 volts. Observe the ammeter on the tester. The reading should be between 50 and 57 amperes. If the alternator performance is O.K., the trouble is in the regulator. The regulator is not serviceable. It must be replaced if it is not working properly.

5. Return the engine speed to idle before releasing the master control knob.

If the alternator output is not O.K. with the regulator bypassed, the problem is in the alternator. It will be necessary to remove the alternator from the vehicle and perform the necessary bench tests to locate the defect.

An output of 2 to 8 amperes below minimum specifications usually indicates an open diode rectifier. An output of approximately 10 to 15 amperes below minimum specification usually indicates a shorted diode rectifier. An alternator with a shorted diode will usually whine, which will be most noticeable at idle speeds.

AUTOLITE STATOR NEUTRAL VOLTAGE TEST—ON ENGINE

The Autolite alternator STA terminal is connected to the stator coil neutral, or center point of the alternator windings (see Figs. 1 and 2). The voltage generated at this point is used to close the field relay in the Autolite charge indicator light system except alternators with an integral regulator.

To test for the stator neutral voltage, disconnect the regulator connector plug from the regulator. Make the connections and tester knob adjustments as shown in Fig. 9.

Start the engine and run it at 1000

rpm (use a tachometer). Turn off all lights and accessories. Rotate the field rheostat clockwise until at least 6 volts is indicated on the voltmeter upper scale. If 6 volts or more is not obtained, remove the alternator and perform the diode and stator tests to determine which part of the alternator is damaged.

FIELD OPEN OR SHORT CIRCUIT TEST—ON BENCH

The first part of this test will determine if the alternator portion of the field coil system, consisting of the field coil, the field coil slip rings and the field coil brush assembly, is satisfactory. The second part of the test will indicate (in case of a field coil system malfunction), which of the above items is causing the malfunction.

Alternators Without An Integral Regulator

Make the connection as shown in Fig. 7 Field Open or Short Circuit Test. The current draw, as indicated by the ammeter, should be to specifications (Section 7 in this part). If there is little or no current flow, the field or brushes have a high resistance or are open. A current flow considerably higher than that specified above, indicates shorted or grounded field turns or brush leads touching. If the test shows that the field is shorted or open, determine if the field brush assembly or slip rings are at fault.

Disassemble the front housing and rotor from the rear housing and stator and check the resistance of the rotor with the Rotunda ARE 27-42 ohmmeter. Set the ohmmeter multiply-by knob at 1 and calibrate the ohmmeter as indicated inside the ohmmeter cover.

Contact each ohmmeter probe to a slip ring. The resistance should be 4 or 5 ohms. A higher reading indicates a damaged slip ring soldered connection or a broken wire. A lower reading indicates a shorted wire or slip ring assembly. Replace the rotor if it can not be repaired.

Contact one ohmmeter probe to a slip ring and the other probe to the rotor shaft. The resistance should be infinite. Any reading other than infinite indicates a short to ground. Inspect the slip ring soldered terminals to make certain that they are not bent and touching the shaft, or that excess solder is not grounding the rotor coil. Replace the rotor if it can not be repaired.

If the rotor checks out O.K., by itself but the overall Field Open or Short Circuit Test (Fig. 7), indicates trouble, the brushes or brush assembly are the cause. Replace damaged parts.

Alternators With An Integral Regulator

Field Test With Voltmeter

1. Turn the ignition switch to OFF. Remove the wire from the regulator supply terminal.
2. Connect the ARE 27-38 tester, and make the tester knob adjustments as shown in Fig. 8, Field Voltmeter Test.
3. The voltmeter reading should be 12 volts. If there is **no** voltage reading, the field circuit is open or grounded.
4. If the voltmeter reading in Step 3 is more than one volt but less than battery voltage, there is an indicated partial ground in the alternator field circuit. Perform the Alternator Field Tests With Ohmmeter.

Field Tests With Ohmmeter

1. Disconnect the battery ground cable.
2. Remove the regulator from the alternator.
3. Connect the ARE 27-42 ohmmeter leads as shown in Fig. 12, Ohmmeter Field Circuit Tests. Set the ohmmeter multiply-by knob at 1, and calibrate the ohmmeter as indicated inside the ohmmeter cover.
4. Three conditions are checked in these tests as shown in Fig. 12: A grounded field, a shorted field and an open field.
5. If any of the above conditions are found, remove the alternator and determine which part of the field circuit is causing the trouble:

Disassemble the front housing and rotor from the rear housing and stator and check the resistance of the rotor with the Rotunda ARE 27-42 ohmmeter. Set the ohmmeter multiply-by knob at 1 and calibrate the ohmmeter as indicated inside the ohmmeter cover.

Contact each ohmmeter probe to a slip ring. The resistance should be 4 of 5 ohms. A higher reading indicates a damaged slip ring soldered connection or a broken wire. A lower reading indicates a shorted wire or slip ring assembly. Replace the rotor if it can not be repaired.

Contact one ohmmeter probe to a slip ring and the other probe to the

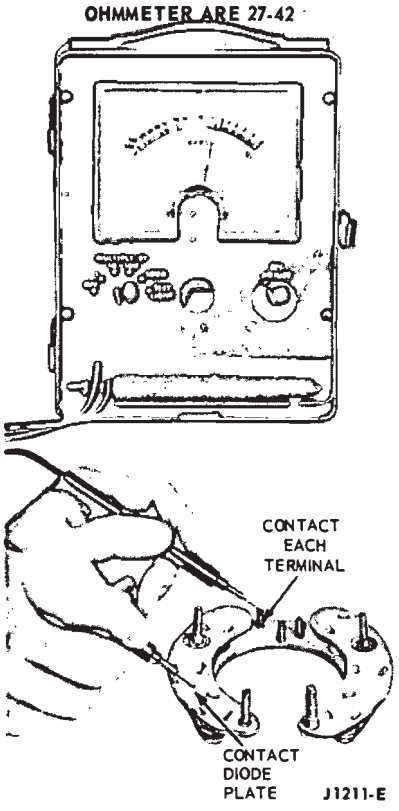


FIG. 10—Autolite Diode Test

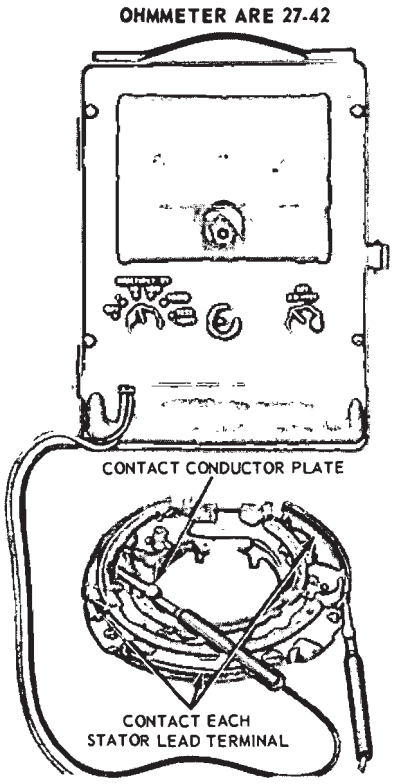


FIG. 11—65-Ampere Autolite Alternator Diode Test

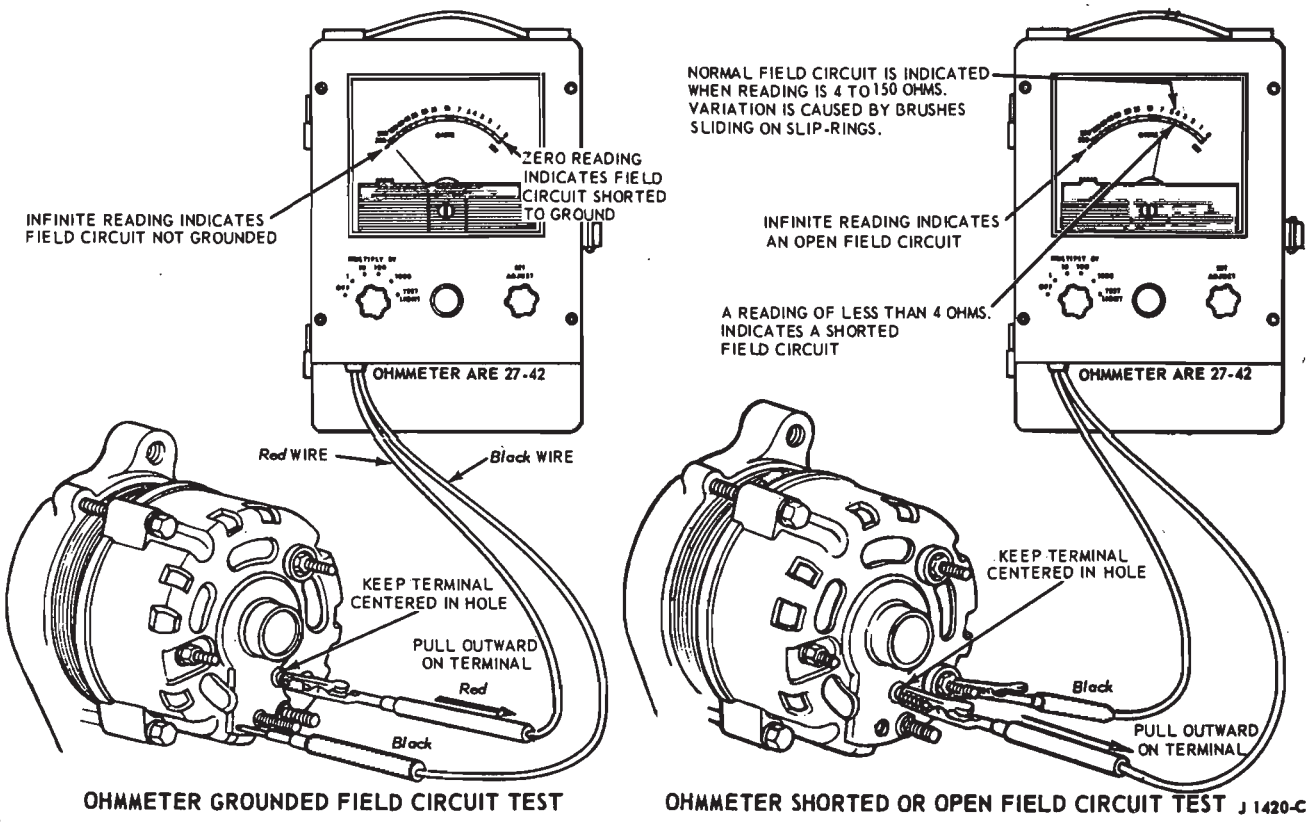


FIG. 12—Ohmmeter Field Circuit Tests—With Integral Regulator

rotor shaft. The resistance should be infinite. Any reading other than infinite indicates a short to ground. Inspect the slip ring soldered terminals to make certain that they are not bent and touching the shaft, or that excess solder is not grounding the rotor coil. Replace the rotor if it can not be repaired.

If the rotor checks out O.K. by itself but the overall Field Open or Short Circuit Test (Fig. 7), indicates trouble, the brushes or brush assembly are the cause. Replace damaged parts.

DIODE TESTS—ON BENCH

Disassemble the alternator (Section 4 in this part), and disconnect the rectifier assembly from the stator and make the test connections as shown in Fig. 10 or 11. To test one set of diodes, contact one probe to the diode plate as shown and contact each of the three stator lead terminals with the other probe. Reverse the probes and repeat the test. Test the other set of diodes in the same way.

All 6 tests should show a low reading of approximately 60 ohms in one direction and infinite reading (no needle movement) with the probes reversed. **Be sure to use the Rotunda ohmmeter with the multiply-by knob at 10, and calibrate the ohmmeter as indicated inside the ohmmeter cover.**

OPEN OR GROUNDED STATOR COIL TESTS—ON BENCH

These tests are made to determine if the stator coil is operating properly. Disassemble the stator from the alternator and rectifier assembly (Section 4 in this part), for these tests.

Open Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by-knob at 1. Connect the ohmmeter probes between each pair of stator leads (Fig. 20). If the ohmmeter does not show equal readings between each pair of stator leads, the stator is open and must be replaced.

Grounded Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by knob at 1000. Connect the ohmmeter probes between one of the stator leads and the stator core. Be sure that the test lead makes a good electrical connection to the core. The ohmmeter should not show any continuity (no reading), if it does show a reading, the stator winding is grounded and must be replaced.

3 REMOVAL AND INSTALLATION

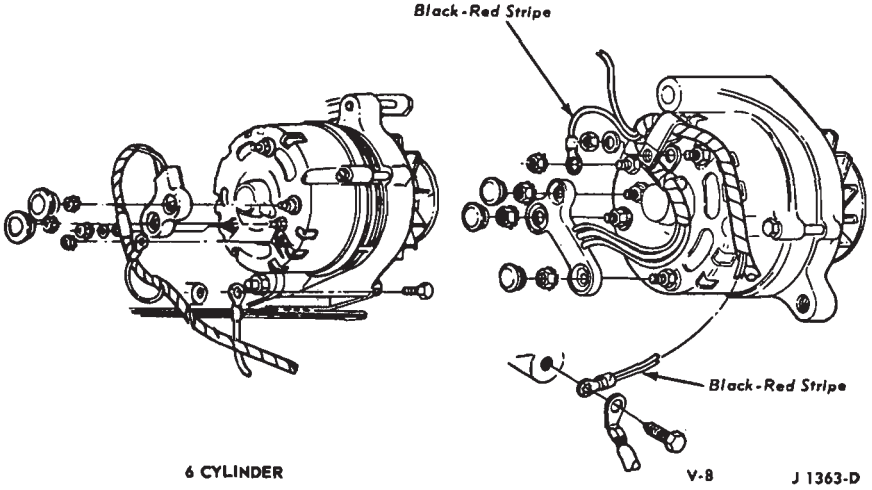


FIG. 13—Wiring Harness Connections—Typical Except 65-Ampere Alternator

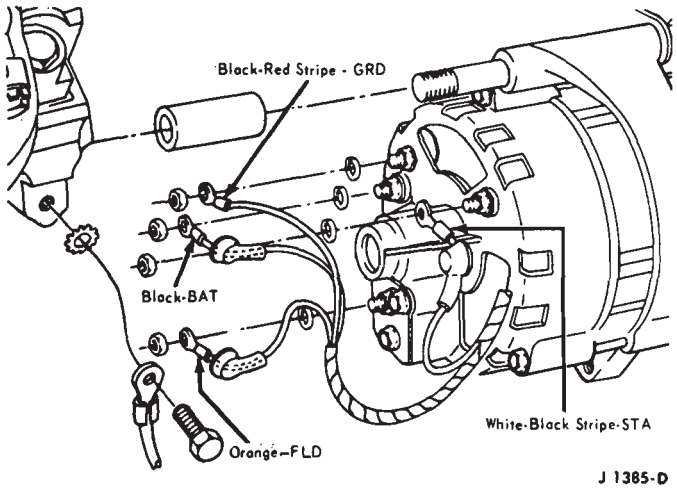


FIG. 14—Wiring Harness Connections—65-Ampere Alternator

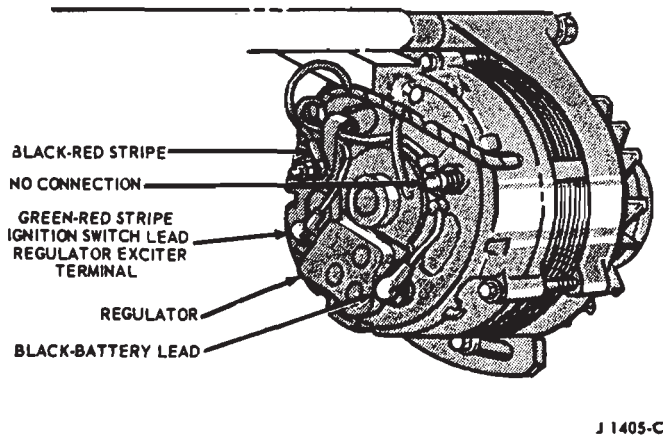


FIG. 15—Wiring Harness Connections—With Integral Regulator

REMOVAL

1. Disconnect the battery ground cable.
2. Loosen the alternator mounting bolts and remove the adjustment arm to alternator bolt. Disengage the alternator belt.
3. On alternators without an integral regulator, remove the connector block covers and remove the alternator connector and wiring harness.
4. On alternators with an integral regulator, remove the electrical connections from the alternator and regulator. Be careful not to damage or loosen the regulator supply terminal wire plastic retainer clip.

Do not attempt to remove the connector by pulling on the wire. The plastic retainer clip must be disengaged from the regulator before the connector can be removed. **Do not *discard the retainer clip.***

5. Remove the alternator mounting bolt, and remove the alternator.

INSTALLATION

1. Install the alternator connector block and plastic covers and wiring harness (Fig. 13, 14 or 15). Position the alternator to the engine, and install the alternator mounting bolt finger-tight and spacer if used.
2. Install the adjustment arm to alternator bolt.
3. Adjust the belt tension using tool T63L-8620-A. **Apply pressure on the alternator front housing only, when tightening the belt.**

Tighten the adjusting arm bolts and the mounting bolt.

4. Connect the battery ground cable.

BELT ADJUSTMENT

1. Loosen the alternator mounting bolt to a snug position and loosen the adjusting arm bolts.
2. **Apply pressure on the alternator front housing only** and tighten the adjusting arm to alternator bolt.
3. Check the belt tension using tool T63L-8620-A. Adjust the belt for specified tension.
4. Tighten all mounting bolts.

4 MAJOR REPAIR OPERATIONS—EXCEPT 65-AMPERE ALTERNATOR

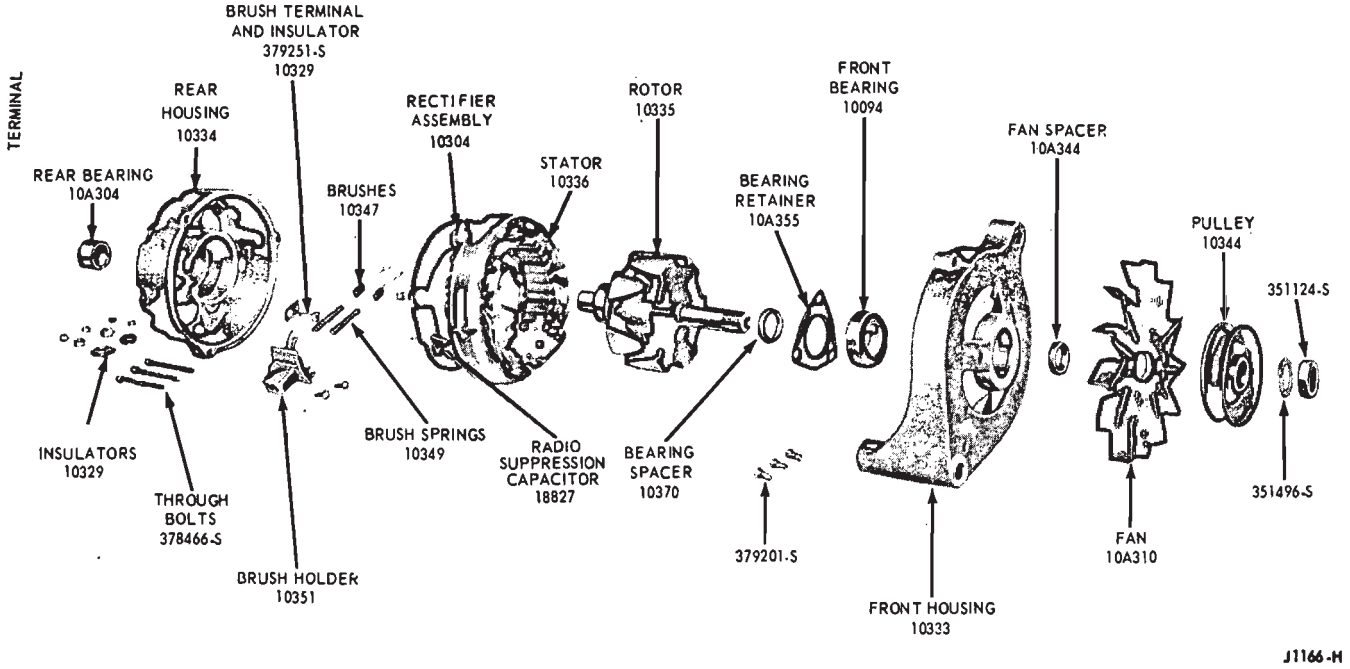


FIG. 16—Disassembled Alternator

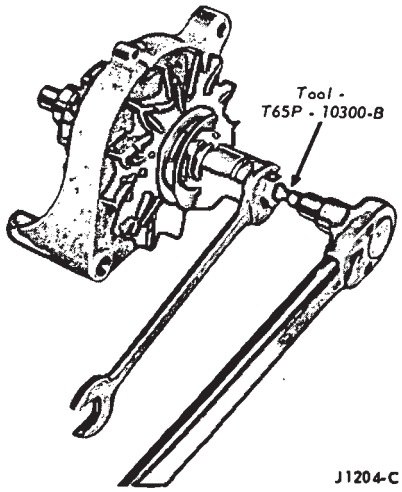


FIG. 17—Pulley Removal

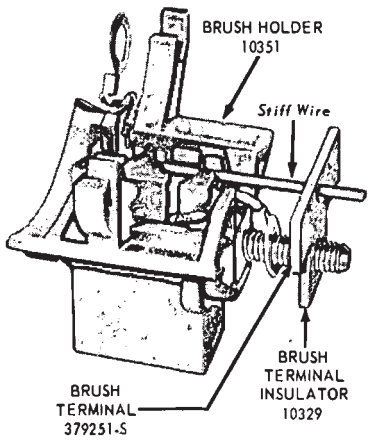


FIG. 18—Brush Holder Assembly—Except With Integral Regulator

DISASSEMBLY

Fig. 16 shows a disassembled view of the Autolite alternator.

1. Mark both end housings and the stator with a scribe mark for assembly.

2. Remove the three housing through bolts.

3. Separate the front housing and rotor from the stator and rear housing.

4. Remove all the nuts and washers from the rear housing and remove the rear housing (and regulator if on an integral regulator alternator), from the stator and rectifier assembly.

5. Remove the brush holder mounting screws and remove the holder, brushes, brush springs, insulator and terminal.

6. If replacement is necessary, press the bearing from the rear housing, supporting the housing on the inner boss.

7. If the rectifier assembly is being replaced, unsolder the stator leads from the printed-circuit board terminals, and separate the stator from the rectifier assembly. Use a 100-watt soldering iron.

8. Original production alternators will have two types of rectifier assembly circuit boards; one having a molded circuit board spaced away from the diode plates and the other having a dull black painted fiber-glass circuit board bonded directly to the diode plates.

If the alternator rectifier has a molded circuit board, remove the screws from the rectifier by rotating the bolt heads 1/4 turn clockwise to unlock them and then remove the screws (Fig. 23). Push the screws out, on a rectifier with a fiber circuit board (Fig. 23). Avoid turning the screw while removing to make certain that the straight knurl will engage the insulators when installing. Do not remove the grounded screw (Fig. 24).

9. Remove the drive pulley nut, lockwasher, pulley, fan, fan spacer, rotor and rotor stop (Fig. 17).

10. Remove the three screws that hold the front end bearing retainer, and remove the retainer. Support the housing close to the bearing boss, and press out the old bearing from the housing, only if the bearing is defective or has lost its lubricant.

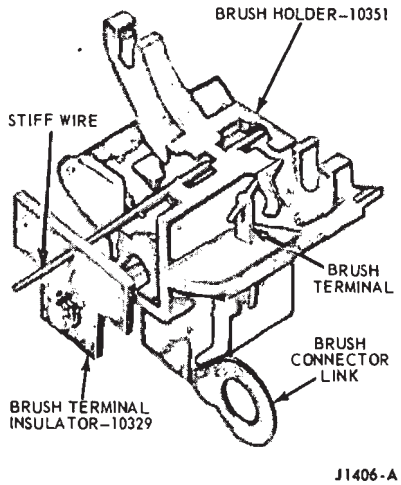


FIG. 19—Brush Holder Assembly—With Integral Regulator

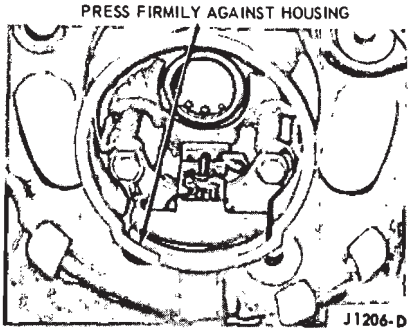


FIG. 20—Brush Lead Positions—Typical

11. Perform a diode test and a field open or short circuit test (Section 2 in this part).

CLEANING AND INSPECTION

1. The rotor, stator and bearings must not be cleaned with solvent. Wipe these parts off with a clean cloth.

2. Rotate the front bearing on the drive end of the rotor drive shaft. Check for any scraping noise, looseness or roughness that will indicate that the bearing is excessively worn. Look for excessive lubricant leakage. If any of these conditions exist, replace the bearing.

3. Inspect the rotor shaft at the rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.

4. Place the rear bearing on the slip-ring end of the shaft and rotate the bearing on the shaft. Make the same check for noise, looseness or roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the bearing if these conditions exist, or if the lubricant is lost or contaminated.

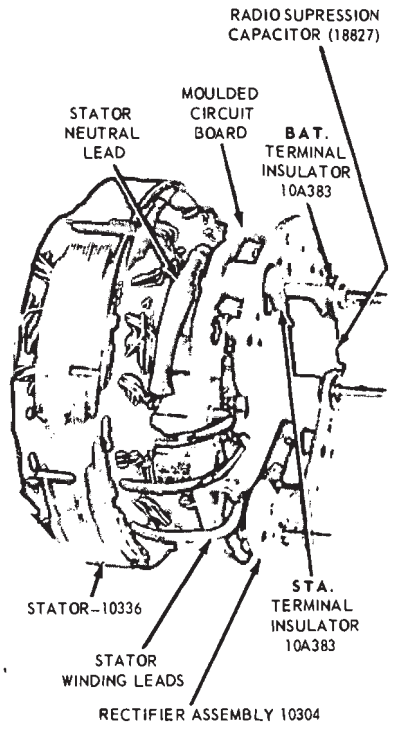


FIG. 21—Stator Lead Connections—Except With Integral Regulator

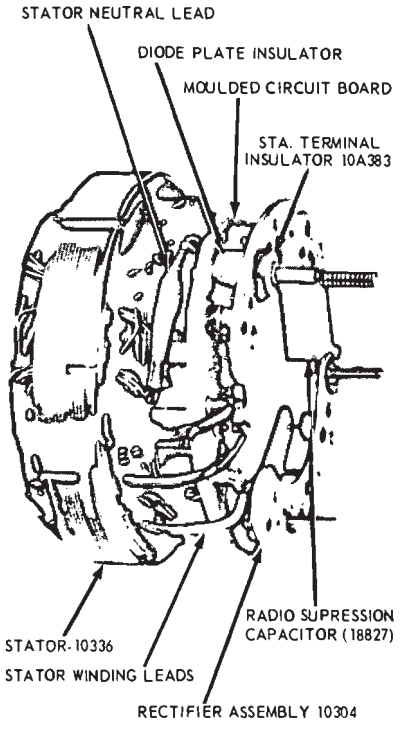


FIG. 22—Stator Lead Connections—With Integral Regulator

5. Check the pulley and fan for excessive looseness on the rotor shaft. Replace any pulley or fan that is loose or bent out of shape. Check the rotor shaft for stripped or damaged threads. Inspect the hex hole in the end of the shaft for damage.

6. Check both the front and rear housings for cracks. Check the front housings for stripped threads in the mounting ear. Replace damaged housings.

7. Check all wire leads on both the stator and rotor assemblies for loose soldered connections, and for burned insulation. Resolder poor connections. Replace parts that show burned insulation.

8. Check the slip rings for nicks and surface roughness. Nicks and scratches may be removed by turning down the slip rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip rings are badly damaged, the entire rotor will have to be replaced, as it is serviced as a complete assembly.

9. Replace any parts that are burned or cracked. Replace brushes and brush springs that are not to specification.

ASSEMBLY

1. Press the front end bearing in the bearing boss (put pressure on the outer race only), and install the bearing retainer.

2. If the stop-ring on the rotor drive shaft was damaged, install a new stop-ring. Push the new ring on the shaft and into the groove. **Do not open the ring with snap ring pliers as permanent damage will result.**

3. Position the rotor stop on the drive shaft with the recessed side against the stop-ring.

4. Position the front housing, fan spacer, fan, pulley and lock washer on the drive shaft and install the retaining nut (Fig. 17), to specified torque (Section 7 in this part).

5. If the rear housing bearing was removed, support the housing on the inner boss and press in a new bearing flush with the outer end surface.

6. Place the brush springs, brushes, brush terminal and terminal insulator in the brush holder and hold the

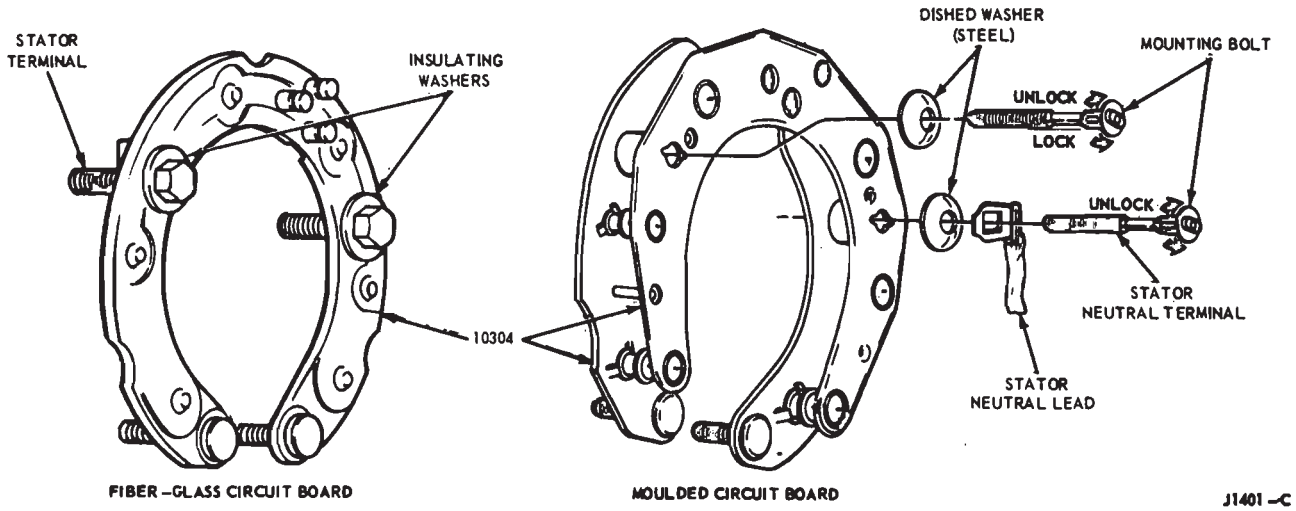


FIG. 23—Rectifier Assembly

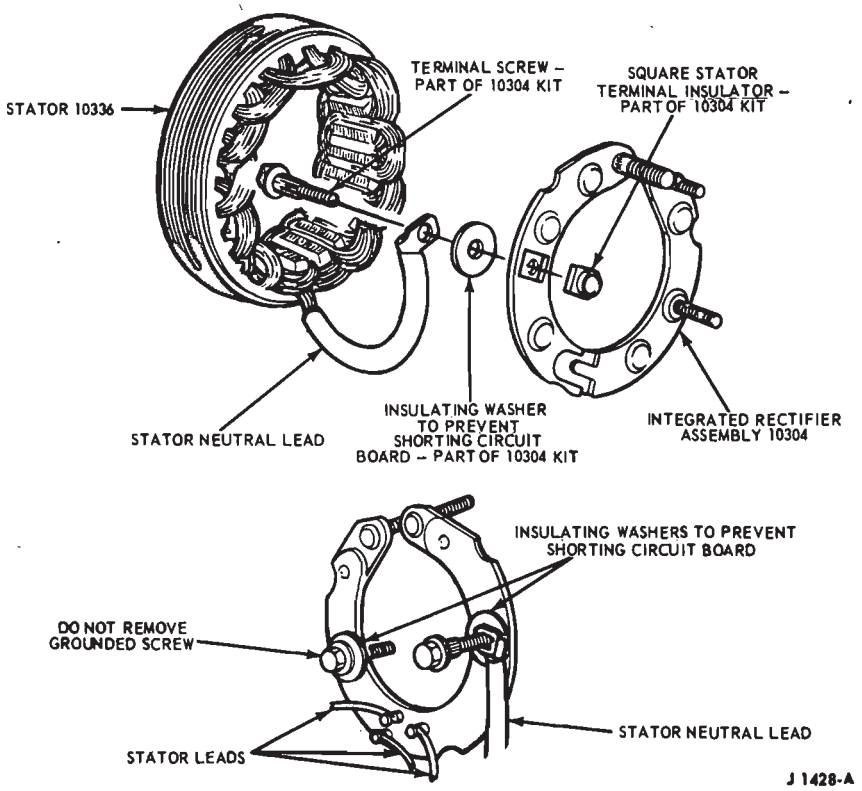


FIG. 24—Stator Terminal Installation—Fiber—Glass Circuit Board

brushes in position by inserting a piece of stiff wire in the brush holder as shown in Figs. 18 or 19.

On an alternator with an integral regulator, position the battery-terminal-to-regulator connector strap and insulator in the rear end housing. Position the voltage regulator to the rear end housing and install the regulator battery terminal nut snug.

7. Position the brush holder assembly in the rear housing and install the mounting screws. Position the brush leads in the brush holder as shown in Fig. 20.

8. Wrap the three stator winding leads around the circuit board terminals and solder them. Use a 100-watt soldering iron and rosin-core solder. Position the stator neutral lead eyelet on the stator terminal screw and install the screw in the rectifier assembly (Fig. 21 or 22).

9. For a rectifier with a molded circuit board, insert the special screws through the wire lug, dished washers and circuit board (Fig. 23). Turn them 1/4 turn counterclockwise to lock them. For fiber circuit boards, insert the screws straight through into the holes (Fig. 24).

The dished washers are to be used on the molded circuit board only. If they are used on the fiber circuit boards, a short circuit will occur. A flat insulating washer is to be used between the stator terminal and the board, when a fiber circuit board is used (Fig. 24).

10. Position the radio noise suppression capacitor on the rectifier terminals. On the molded circuit board install the STA and BAT terminal insulators (Fig. 21 or 22). On the fiber circuit board position the square stator-terminal insulator in the square hole in the rectifier assembly (Fig. 24). Position the BAT terminal insulator (Fig. 25).

Position the stator and rectifier assembly in the rear housing. Make certain that all terminal insulators are seated properly in the recesses (Fig. 29). Position the STA (black), BAT (red) and FLD (orange) insulators on the terminal bolts, and install the retaining nuts (Fig. 26 or 27).

11. Wipe the rear end bearing surface of the rotor shaft with a clean lint-free rag.

12. Position the rear housing and stator assembly over the rotor and align the scribe marks made during disassembly. Seat the machined portion of the stator core into the step in both end housings. Install the housing through bolts. Remove the brush retracting wire, and put a daub of water-proof cement over the hole to seal it.

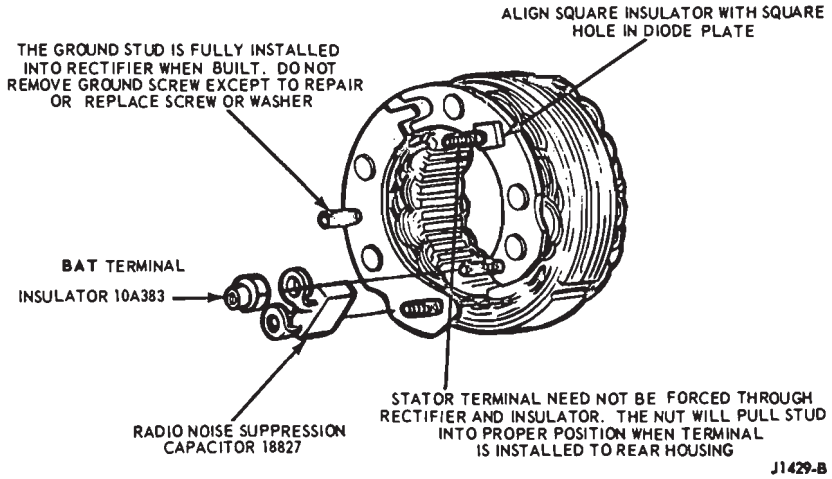


FIG. 25—Terminal Insulators—Fiber-Glass Circuit Board

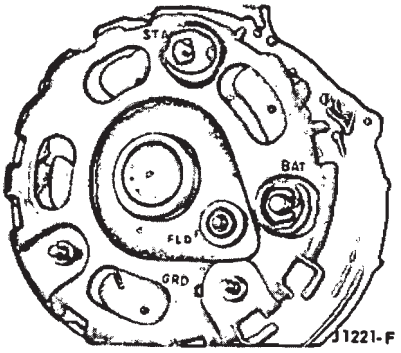


FIG. 26—Alternator Terminal Locations—Except With Integral Regulator

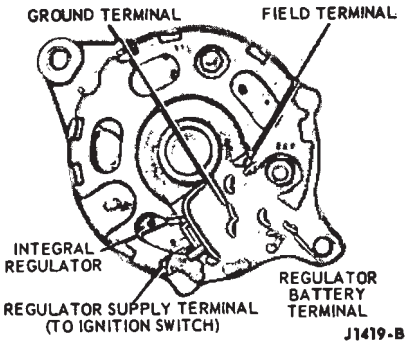


FIG. 27—Alternator Terminal Locations—With Integral Regulator

5 MAJOR REPAIR OPERATIONS—65-AMPERE ALTERNATOR

DISASSEMBLY

Fig. 28 shows a disassembled view of the Autolite 65-ampere alternator.

1. Remove the brush holder and cover assembly from the rear end housing.
2. Mark both end housings and the stator with a scribe mark for assembly.
3. Remove the three housing through bolts.
4. Separate the front housing and rotor from the stator and rear housing.
5. Remove the drive pulley nut, lockwasher, flat washer, pulley, fan, fan spacer and rotor from the front housing (Fig. 17).
6. Remove the three screws that hold the front bearing retainer, and remove the retainer. Support the housing close to the bearing boss, and press out the bearing from the housing, only if the bearing is defective or has lost its lubricant.
7. Remove all the nut and washer assemblies and insulators from the rear housing and remove the rear housing from the stator and rectifier assembly.
8. If replacement is necessary, press the bearing from the rear housing, supporting the housing on the inner boss.
9. Unsolder the three stator leads from the rectifier assembly, and separate the stator from the assembly. Use a 200 watt soldering iron.
10. Perform a diode test and an open and grounded stator coil test.

PARTS REPAIR OR REPLACEMENT

Nicks and scratches may be removed from the rotor slip rings by turning down the slip rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip rings are badly damaged, the entire rotor must be replaced as it is serviced as an assembly. The rectifier is also serviced as an assembly.

ASSEMBLY

1. If the front bearing is being replaced, press the new bearing in the bearing boss putting pressure on the outer race only, then install the bearing retainer, and tighten the retainer screws until the tips of the retainer touch the housing.
2. Position the rectifier assembly to the stator, wrap the three stator leads around the diode plate terminals and solder them (Fig. 29). Use a 200 watt soldering iron.
3. If the rear housing bearing was removed, press in a new bearing from the inside of the housing, putting pressure on the outer race only.
4. Install the BAT-GRD insulator (Fig. 29), and position the stator and rectifier assembly in the rear housing.
5. Install the STA (purple) and BAT (red) terminal insulators on the

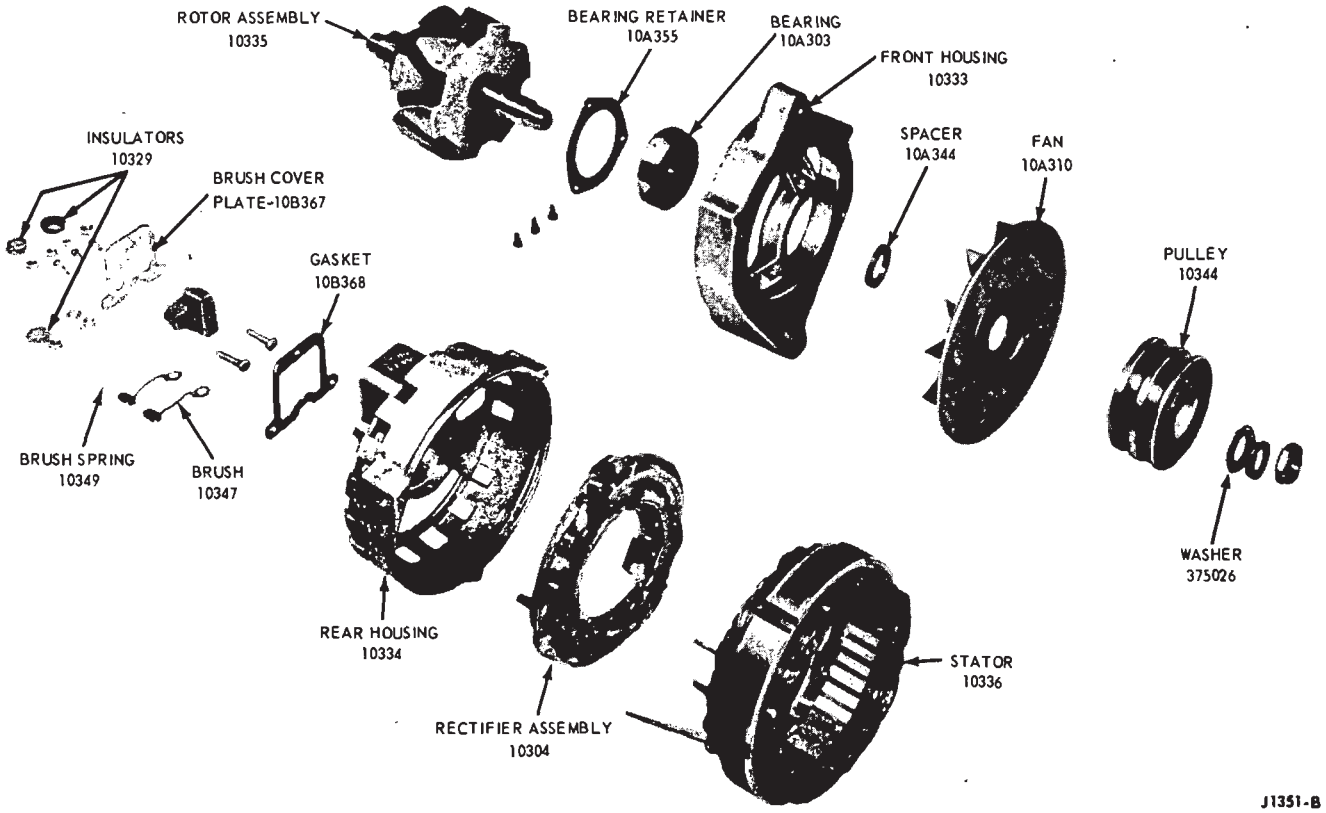


FIG. 28—Disassembled 65-Ampere Autolite Alternator

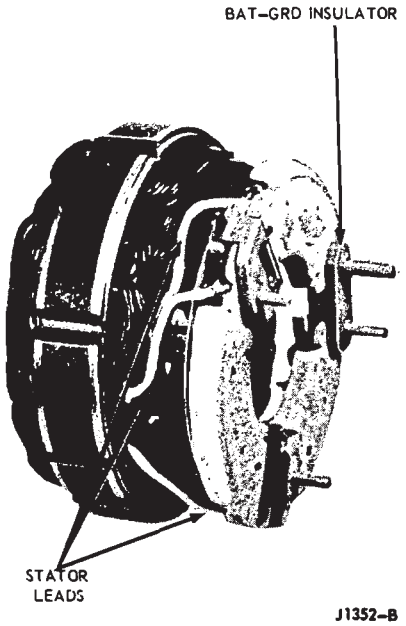


FIG. 29—Stator Lead Connections

terminal bolts and install the nut and washer assemblies. **Make certain that the shoulders on all insulators both inside and outside of the housing are seated properly before tightening the nuts.**

6. Position the front housing over the rotor and install the fan spacer, fan, pulley, flat and lock washers and nut on the rotor shaft (Fig. 17).

7. Wipe the rear bearing surface of the rotor shaft with a clean lint free rag.

8. Position the rotor with the front housing into the stator and rear housing assembly, and align the scribe marks made during disassembly. Seat the machined portion of the stator core into the step in both housing, and install the through bolts.

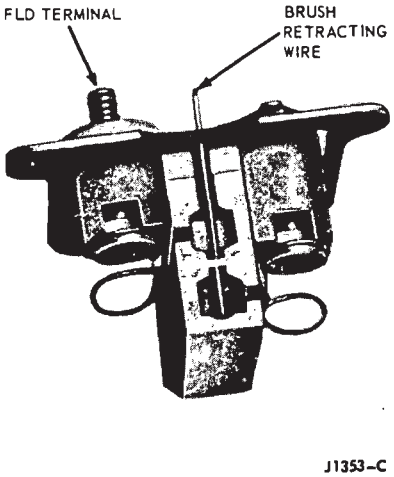


FIG. 30—Field Brush Assembly

9. If the field brushes have worn to less than 3/8 inch, replace both brushes. Hold the brushes in position by inserting a stiff wire in the brush holder (Fig. 30).

10. Position the brush holder assembly into the rear housing and install the three mounting screws. Remove the brush retracting wire and put a daub of water-proof cement over the hole to seal it.

BRUSH REPLACEMENT

1. Remove the brush holder and cover assembly from the rear housing.

2. Remove the terminal bolts from the brush holder and cover assembly, and remove the brush assemblies.

3. Position the new brush terminals on the terminal bolts and assemble the terminals, bolts, brush holder washers and nuts (Fig. 30). The insulating washer mounts under the FLD terminal nut. The entire brush and cover assembly is also available for service.

4. Depress the brush springs in the brush holder cavities and insert the brushes on top of the springs. Hold the brushes in position by inserting a stiff wire in the brush holder as

shown in Fig. 30. Position the brush leads as shown in Fig. 30.

5. Install the brush holder and cover assembly to the rear housing. Remove the brush retracting wire and put a daub of water-proof cement over the hole to seal it.

6 CHARGING SYSTEM FUSE LINK

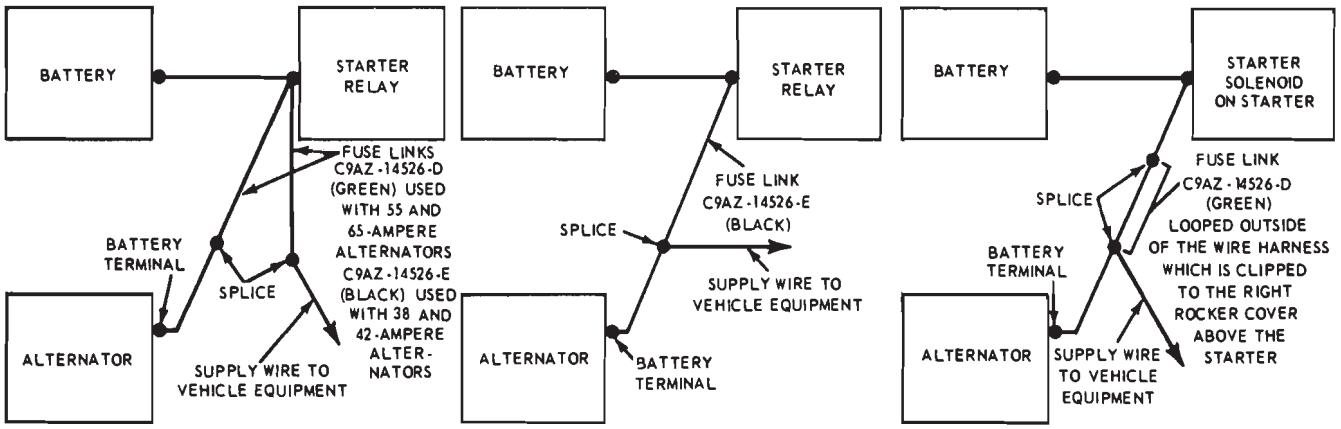


FIG. 31—Fuse Link Installation

DESCRIPTION AND OPERATION

The fuse link is a short length of insulated wire integral with the engine compartment wiring harness. It is several wire gages smaller than the circuit that it protects. Production fuse links are black. Service fuse links are green or black depending on usage. All fuse links have the words FUSE LINK printed on the insulation. Fig. 31 shows fuse link installations.

The fuse link burns out, thus protecting the alternator or wiring, when heavy current flows, such as when a booster battery is connected incorrectly or a short to ground occurs in the wiring harness.

A burned out link may have bare wire ends protruding from the insulation, or it may only have expanded or bubbled insulation with illegible identification. If it is hard to determine if the link is burned out, perform a continuity test.

CONTINUITY TEST

1. On the Cougar, Mustang, Thunderbird, Lincoln Continental and Continental Mark III, make certain first that the battery is OK, then turn on the headlights or any accessory. If the headlights or accessory do not operate, the fuse link is probably burned out.

2. On the Ford, Mercury, Meteor, Fairlane, Falcon, Montego and Maverick, there are two fuse links (Fig. 31). Use the same procedure as in step 1 to test the fuse link that protects the vehicle equipment.

To test the fuse link that protects the alternator, make certain that the battery is OK then check with a voltmeter for voltage at the BAT terminal of the alternator. No voltage indicates that the fuse link is probably turned out.

FUSE LINK REPLACEMENT

1. Procure the proper service fuse link for the vehicle being repaired (Fig. 31). The two fuse links shown have an eyelet terminal for a 5/16-inch stud on one end. When the terminal is not required, cut off the fuse link as close to the terminal as possible and strip approximately 3/8-inch of insulation from the cut end.

2. Disconnect the battery ground cable.

3. Disconnect the fuse link and/or fuse link eyelet terminal from the battery terminal of the starter relay. On the Thunderbird, Lincoln Continental and the Continental Mark III, the fuse link is looped outside of the wire harness behind the point at which the harness is clipped to the right rocker cover above the starter.

4. Cut the fuse link and the splice(s) from the wire(s) to which it is attached.

5. Splice and solder the new fuse link to the wire(s) from which the old link was cut. Use rosin core solder. Wrap the splice(s) completely with vinyl electricians tape.

6. Securely connect the eyelet terminals (if any) to the battery stud on the starter relay.

7. Install the repaired wiring as before using existing clips if provided.

8. Connect the battery ground cable.

7 SPECIFICATIONS

ALTERNATOR

Supplier	Stamp Color	Rating Amperes @ 15V	Rating Watts @ 15V	Field Current Amps @ 12V	Cut-In Speed rpm)	Rated Output Speed (Engine rpm) Cold	Rated Output Speed (Engine rpm) Hot	Slip-Ring Turning (Inches) Min. Dia.	Slip-Ring Turning (Inches) Max. Runout	Brush Length (Inches) New	Brush Length (Inches) Wear Limit	Pulley Nut Torque (Ft-Lbs)	Belt① Tension (Lbs)
Autolite	Purple	38	570	2.4	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Autolite	Orange	42	630	2.9	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Autolite	Red	55	825	2.9	400	2000	2900	1.22	0.0005	1/2	5/16	60–100	70–110
Autolite	Black	65	975	2.9	360	1640		1.22	0.0005	5/8	3/8	60–100	70–110

①Used Belt. New Belt 140. A used belt is one that has been in operation more than 10 minutes. If belt tension is out of specification, or belt has been removed, reset to 110 lbs.

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
T63L-8620-A	8620 BT-33-73-F	Belt Tension Gauge
T65P-10300-B		Alternator Pulley Remover

Ford Tool No.	Former No.	Description
ARE-16-31		Battery Starter Tester
ARE-20-22		Alternator-Regulator Tester
ARE-27-38		Volt-Amp. Regulator Tester
ARE-27-42		Ohmmeter

PART 31-03 Autolite Alternator Regulators

COMPONENT INDEX Applies to Models As Indicated	All Models	Ford	Mercury	Meteor	Cougar	Fairlane	Falcon	Maverick	Montego	Mustang	Lincoln-Continental	Thunderbird	Continental-Mark III
INTEGRAL ALTERNATOR REGULATOR													
Adjustments		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03-04	03-04	03-04
Description and Operation		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03-01	03-01	03-01
Removal and Installation		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03-04	03-04	03-04
Testing		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03-02	03-02	03-02
NON-INTEGRAL ALTERNATOR REGULATOR													
Adjustments		03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04	N/A	N/A	N/A
Description and Operation		03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01	N/A	N/A	N/A
Removal and Installation		03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04	N/A	N/A	N/A
Testing		03-02	03-02	03-02	03-02	03-02	03-02	03-02	03-02	03-02	N/A	N/A	N/A
SPECIFICATIONS	03-05												

A page number indicates that the item is for the vehicle listed at the head of the column.
N/A indicates that the item is not applicable to the vehicle listed.

1 DESCRIPTION AND OPERATION

ELECTRO-MECHANICAL ALTERNATOR REGULATOR

The alternator regulator has been designed to exercise automatic control over the charging system, and also to compensate for seasonal temperature changes. The Autolite electromechanical regulator is factory calibrated and is not to be adjusted.

The alternator regulator is composed of two control units, a field relay and a voltage limiter, mounted as an assembly (Fig. 1). Refer to Wiring Diagram Manual Form 7795P-70 for schematics and locations of wiring harnesses.

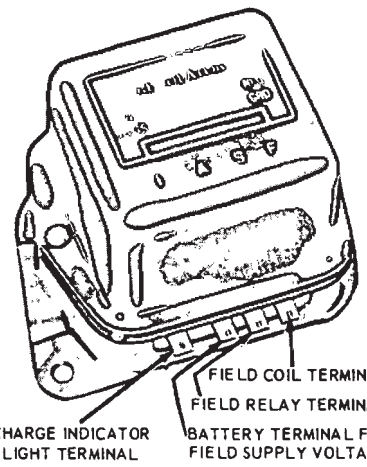


FIG. 1—Electro-Mechanical Alternator Regulator

FIELD RELAY

The field relay serves to connect charging system voltage to the field circuit when the engine is running.

CHARGE INDICATOR CIRCUIT—LIGHT

When the ignition switch is closed, the charge indicator light, in parallel with a 15-ohm resistor, supplies adequate starting field current.

When the alternator builds up enough voltage to close the field relay contacts, full voltage is applied to the field, and the charge indicator light goes out.

CHARGE INDICATOR CIRCUIT—AMMETER

When the ignition switch is closed, the field relay is energized. Closing of the relay contacts connects the battery and alternator output to the field through the voltage limiter contacts.

VOLTAGE LIMITER

The temperature compensated voltage limiter is a double contact unit. Voltage limiting is accomplished by controlling the amount of current supplied to the rotating field.

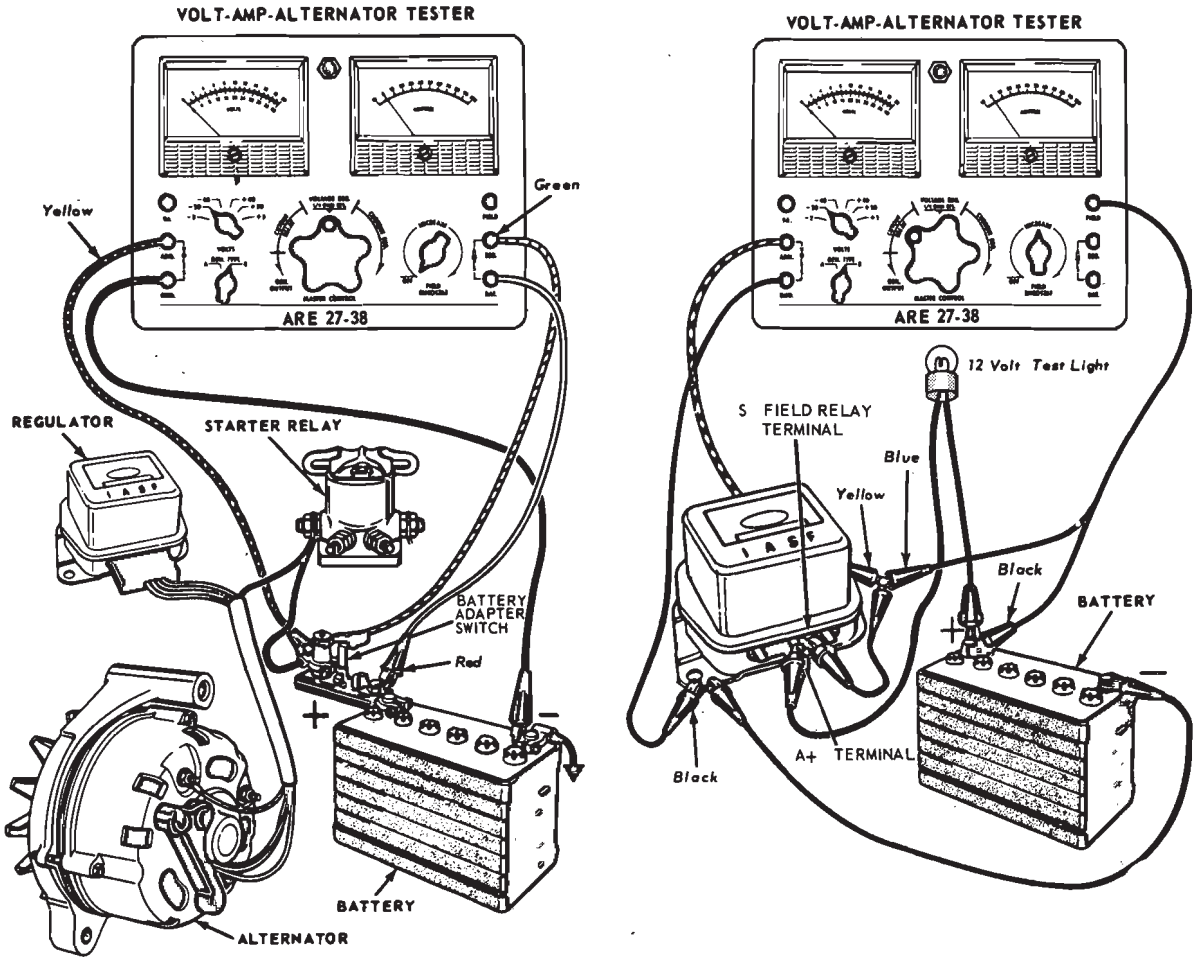
INTEGRAL REGULATOR

The integral regulator (Fig. 4), is a hybrid unit consisting of solid state devices which are technically referred to as integrated circuits (IC) and discrete components. An integrated circuit is composed of transistors, diodes, and resistors all fabricated within a single piece of silicon crystal

measuring about 1/8 inch square. All these parts are interconnected by means of very small aluminum conductors. This circuitry is not repairable or adjustable. If the regulator is not operating properly, it must be replaced.

The size of the regulator housing is determined by the need for connections to the alternator. Terminals built into the regulator housing furnish the circuit connecting points. The ignition switch connection provides the power for energizing the integrated circuit, which in turn controls the alternator field circuit and regulates the alternator voltage.

2 AUTOLITE REGULATOR TESTING



VOLTAGE LIMITER TEST

FIELD RELAY TEST

J1395-B

FIG. 2—Electro-Mechanical Regulator Tests

Refer to the Ford Car and Truck Diagnosis Manual for regulator diagnosis procedures. Use the Rotunda ARE 20-22 tester to test the electromechanical regulator only. **It can not be used to test the integral regulator.** Refer to Section 2 Part 31-02.

Use care when connecting the test equipment to the alternator as the alternator output terminal is connected to the battery at all times. Under no circumstances should the integral regulator battery terminal be connected to the regulator field terminal. To do so will permanently damage the integral regulator. Use the Rotunda ARE 27-38 tester for the following tests:

VOLTAGE LIMITER TEST

Voltage limiter calibration tests

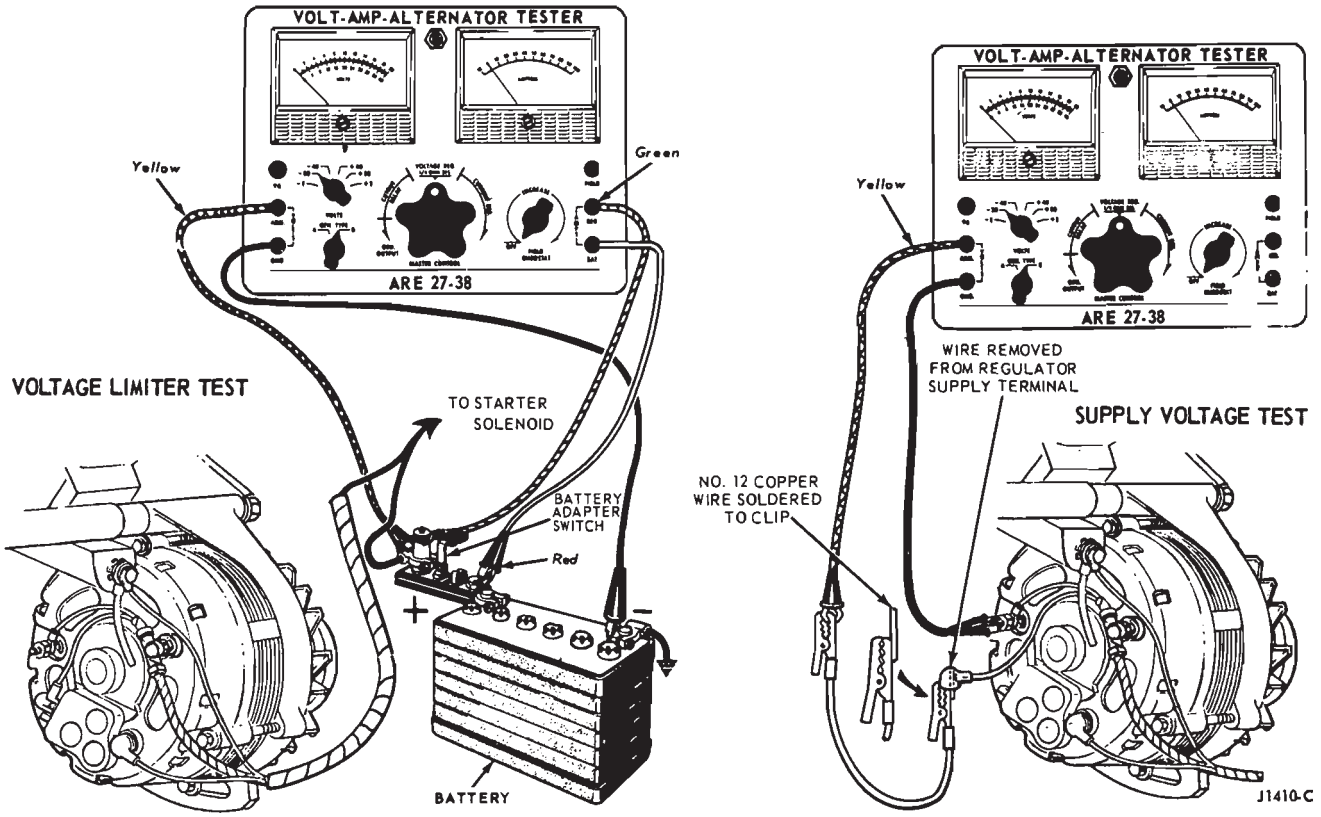


FIG. 3—Integral Regulator Tests

must be made with the regulator operating with battery and ignition loads only.

For accurate voltage limiter testing, the battery specific gravity must be at least 1.230. **If the battery is low in charge, either charge it to 1.230 specific gravity or substitute a fully charged battery, before making a voltage limiter test.**

To test the regulator on the vehicle, make the test connections to the battery and tester knob adjustments as shown in Fig. 2 or 3 Voltage Limiter Test.

1. Place the transmission in neutral or park **and apply the parking brake.**
2. Close the battery adapter switch and start the engine. Make sure that all lights and electrical accessories are off. Open the battery adapter switch.
3. Operate the engine at approximately 2000 rpm for 5 minutes. (Use a tachometer).
4. Read the voltmeter on the tester. If the voltage is within specifications (Section 5 in this part), the voltage regulator and alternator are functioning normally.
5. On a unit with an integral regulator, if the voltage does not rise above the battery voltage, perform a Regulator Supply Voltage Test to make certain that battery voltage is being supplied to the regulator.

If the regulated voltage is not within specifications (Section 5 in this part), replace the regulator. However, before replacing a regulator, make certain that the alternator and charging system wiring are not at fault. Follow trouble shooting procedures.

FIELD RELAY TEST—ELECTRO-MECHANICAL REGULATOR

Remove the regulator from the vehicle. Make the connections as shown in Fig. 2 Field Relay Test. Slowly rotate the field rheostat knob clockwise from the maximum counterclockwise position until the test light comes on. Observe the voltmeter reading at the moment that the test light comes on. This is the relay closing voltage. If the relay closes immediately, even with the field rheostat knob close to the maximum counterclockwise position, push the red button between the two meters, and repeat the test. If the closing voltage is not to specifications, (Section 5 in this part), replace the regulator.

INTEGRAL REGULATOR SUPPLY VOLTAGE

The alternator integral regulator is turned on by the application of battery voltage from the ignition switch. A 10-ohm resistor wire is in series with this supply circuit. If the supply circuit is disconnected or defective there will be no regulator action and no alternator output.

SUPPLY VOLTAGE TEST

1. Connect a 12-volt test light or voltmeter between the regulator supply lead and ground (Fig. 3 Supply Voltage Test). Turn the ignition switch to ON. The test light should glow or the voltmeter should show voltage.
2. If no voltage is indicated, the supply circuit is disconnected or broken.

3 REMOVAL AND INSTALLATION

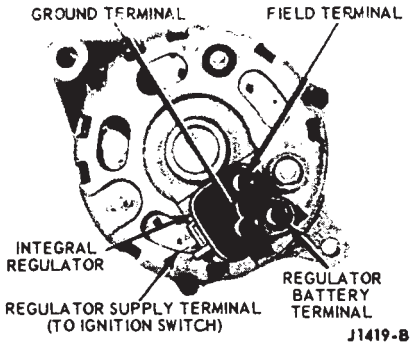


FIG. 4—Alternator With Integral Regulator

ELECTRO-MECHANICAL REGULATOR

1. Remove the battery ground cable. On Ford and Mercury vehicles loosen the battery hold down and position the battery away from the fender.
2. Remove the regulator mounting screws.
3. Disconnect the regulator from the wiring harness.
4. Connect the new regulator to the wiring harness.
5. Mount the regulator to the regulator mounting plate. The radio suppression condenser (electro-mechanical regulator), mounts under one mounting screw. The ground lead mounts under the other mounting screw.
6. On the Ford and Mercury position the battery and install the hold down. Connect the battery ground cable, and test the system for proper voltage regulation.

INTEGRAL REGULATOR

REMOVAL

1. Disconnect the battery ground cable.
2. Loosen the alternator mounting bolts. Remove the belt and swing the alternator down so that the regulator will clear the engine.
3. Remove the terminal covers from the regulator (Fig. 4), and remove the nuts from the alternator studs.
4. Remove the regulator from the alternator, press on the sides of the plastic retainer clip and remove the regulator voltage supply wire from the regulator.

Do not attempt to remove the connector by pulling on the wire. The plastic retainer clip must be disengaged from the regulator before the connector can be removed. **Do not discard the retainer clip.**

INSTALLATION

1. Connect the regulator voltage supply wire to the regulator supply terminal. Be sure that the retainer clip is secured in place.
2. Place the regulator in position on the alternator, install the nuts on the studs. Make certain that the regulator is seated flush to the alternator rear casting before tightening the nuts. Torque to specifications (Part 14-6). **Do not over torque.** Excessive torque on the nuts will damage the regulator.
3. Install the terminal covers. Reseal the brush retracting wire hole if necessary.
4. Place the belt on the alternator pulley and adjust the belt tension to specification (Section 5 in this part), using tool T63L-8620-A. **Apply pressure on the alternator front housing only when tightening the belt.** Tighten the adjusting arm bolts and the mounting bolt.
5. Connect the battery ground cable.

4 REGULATOR ADJUSTMENTS

ELECTRO-MECHANICAL REGULATOR

The Autolite electro-mechanical regulator is factory calibrated and sealed and is not to be adjusted. If the regulator is not calibrated within the specified limits (Section 5 in this part) it must be replaced.

INTEGRAL REGULATOR

The Autolite integral regulator (Fig. 4), is sealed in plastic and can not be adjusted. It must be replaced if it is not calibrated within the specified limits (Section 5 in this part).

5 SPECIFICATIONS

REGULATOR

Regulator	Current Rating	Voltage Limiter (Volts)		Field Relay Closing Volts	Regulator	Current Rating	Voltage Limiter (Volts)
		Temp °F	Setting				Setting
Autolite Electro-Mechanical	Used With All Autolite Alternators ①	50° to 125° F	15.3 to 13.5	2.0–4.2	Autolite Integral	Used With Autolite 55 Ampere Alternator ②	15.3 to 13.3

①Silver Stamp Color is used with 38 and 42-ampere alternators. Yellow Stamp Color is used with 55 and 65-ampere alternators.
②Integral regulator retaining nut torque: Ground and field terminal 15-25 in-lbs., battery terminal 10-15 in-lbs.

PART 31-04 *Leece Neville Alternators*

COMPONENT INDEX Applies to Ford and Mercury Only		COMPONENT INDEX Applies to Ford and Mercury Only	
ADJUSTMENT—BELT	04-03	TESTING	
DESCRIPTION AND OPERATION	04-01	With Rotunda Regulator Tester (ARE 27-38)	
DISASSEMBLY AND OVERHAUL		Diode Test	04-02
65-Ampere Alternator	04-04	Field Open or Short Circuit Test	04-01
REMOVAL AND INSTALLATION	04-03	Stator Open or Grounded Circuit Tests	
SPECIFICATIONS	04-05	Output Test	04-01

A page number indicates that the item is for the vehicle listed at the head of the column.

1 DESCRIPTION AND OPERATION

The operation and general electrical description of the 65-ampere Leece Neville alternator is the same as that for the Autolite alternator (Section 5 in this part). The field brushes of the 65-ampere alternator are mounted in a sealed brush holder on the brush housing (Fig. 4). Two shielded and sealed ball bearings support the rotor in both end housings.

Refer to Wiring Diagram Manual Form 7795P-70 for schematics and locations of wiring harnesses.

2 LEECE NEVILLE ALTERNATOR TESTING

TEST USING THE ROTUNDA VOLT-AMP ALTERNATOR TESTER ARE 27-38

The following test procedures make use of the Rotunda Volt-Amp-Alternator Tester ARE 27-38.

Refer to Wiring Diagram Manual Form 7795P-70 for schematics and locations of wiring harnesses. **Use care when connecting any test equipment to the alternator system, as the alternator output terminal is connected to the battery at all times.**

ALTERNATOR OUTPUT TEST ON ENGINE

When the alternator output test is conducted off the car, a test bench must be used. Follow the procedure given by the test bench equipment manufacturer. **When the alternator is removed from the vehicle for this purpose always disconnect a battery cable as the alternator output connector is connected to the battery at all times.**

To test the output of the alternator on the vehicle, proceed as follows:

1. Place the transmission in neutral or park **and apply the parking brake.** Make the connections and tester knob adjustments as shown in Fig. 1 Output Test. Be sure that the field rheostat knob is at the OFF position at the start of this test.
2. Close the battery adapter switch. Start the engine, then open the battery adapter switch.
3. Increase the engine speed to approximately 2000 rpm (use a tachometer). Turn off all lights and electrical accessories.
4. Turn the field rheostat clockwise until 15 volts is indicated on the voltmeter upper scale. Turn the master control clockwise until the voltmeter indicates between 11 and 12 volts. Holding the master control in this position turn the field rheostat clockwise to its maximum rotation. Turn the master control counterclockwise until the voltmeter indicates 15 volts. Observe the ammeter reading. Add 2 amperes to this reading to obtain alternator output. If rated output (Section 5 in this part), cannot be obtained, increase the engine speed to 2900 rpm and repeat this step.
5. Return the field rheostat knob to OFF, release the master control knob, and stop the engine. Disconnect the test equipment, if no further tests are to be made.

An output of 2 to 5 amperes below specifications usually indicates an open alternator diode. An output of approximately 10 amperes below specifications usually indicates a shorted alternator diode. An alternator with a shorted diode will usually whine.

FIELD OPEN OR SHORT CIRCUIT TEST—ON BENCH

Make the connection as shown in Fig. 1 Field Open Or Short Circuit Test. The current draw, as indicated by the ammeter, should be to specifications (Section 5 in this part). If there is little or no current flow, the field or brushes have a high resistance or are open. A current flow considerably higher than that specified, indicates shorted or grounded field turns or brush leads touching. If the test shows that the field is shorted or open and the field brush assembly or slip rings are not at fault, the entire rotor must be replaced.

If the alternator has output at low

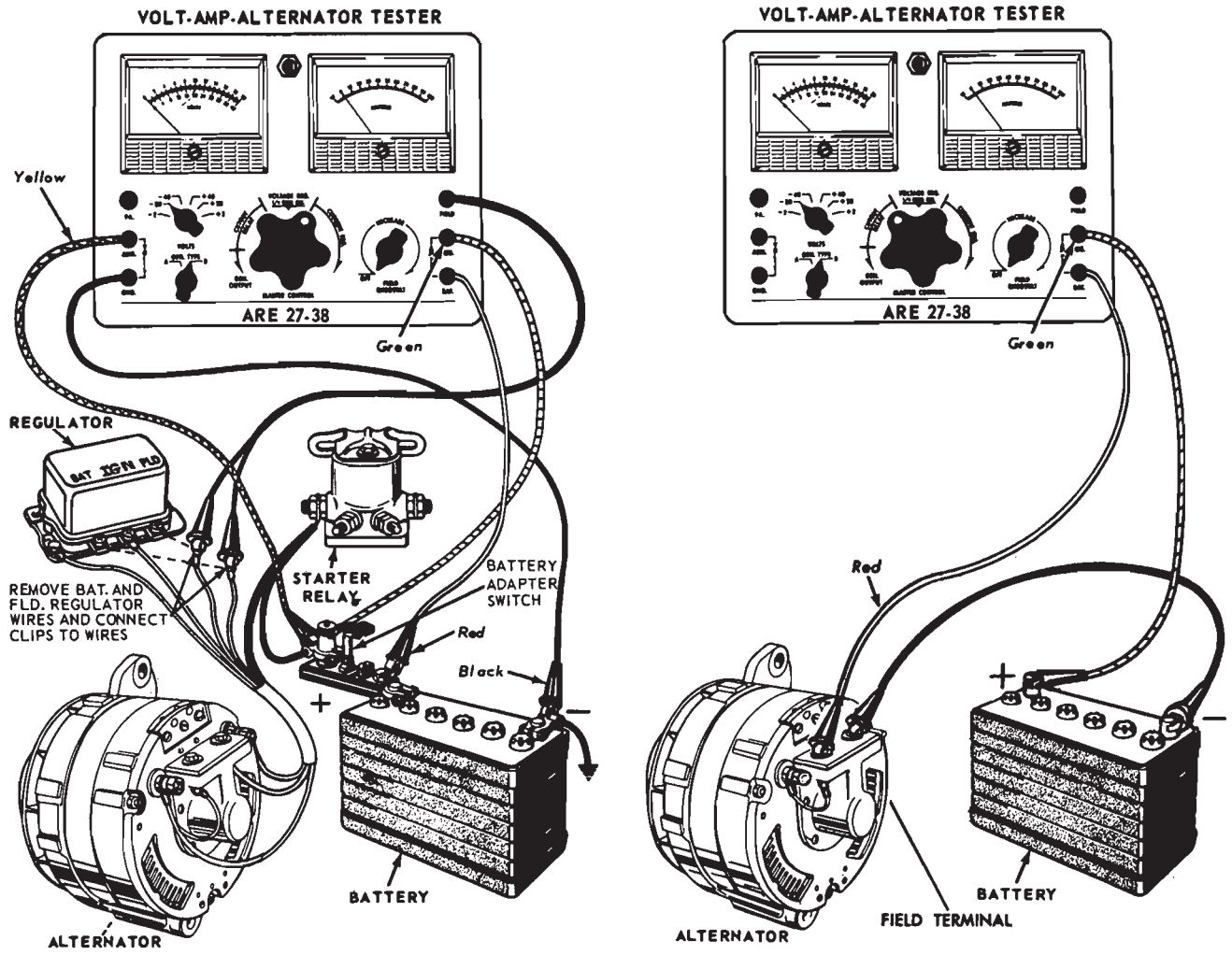


FIG. 1—Alternator Tests—Leece Neville

rpm and no output at high rpm, centrifugal force may be causing the rotor windings to short to ground. Put the alternator on a test stand and repeat the preceding test. Run the alternator at high speed during the test.

DIODE TEST—ON BENCH

Disassemble the alternator (Section 4 in this part), and disconnect the diode assembly from the stator and make the test connections as shown in Fig. 2.

To test one set of diodes, contact one probe to the diode plate as shown and contact each of the three stator lead terminals with the other probe. Reverse the probes and repeat the test. Test the other set of diodes in the same way.

All 6 tests should show a low reading of approximately 60 ohms in one direction and infinite reading (no needle movement) with the probes reversed. **Be sure to use the Rotunda ohmmeter with the multiply-by knob at 10, and calibrate the ohmmeter, as indicated inside the ohmmeter cover.**

OPEN OR GROUNDED STATOR COIL TESTS—ON BENCH

These tests are made to determine if the stator coil is operating properly. Disassemble the stator from the alternator and rectifier assembly (Section 4 in this part), for these tests.

Open Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by knob at 1. Connect the ohmmeter probes between each pair of stator leads (Fig. 5). If the ohmmeter does not show equal readings between each pair of stator leads, the stator is open and must be replaced.

Grounded Stator Test—On Bench

Set the Rotunda ohmmeter multiply-by knob at 1000. Connect the ohmmeter probes between one of the stator leads and the stator core. Be sure that the test lead makes a good electrical connection to the core. The ohmmeter should not show any continuity (no reading), if it does, the stator winding is grounded and must be replaced.

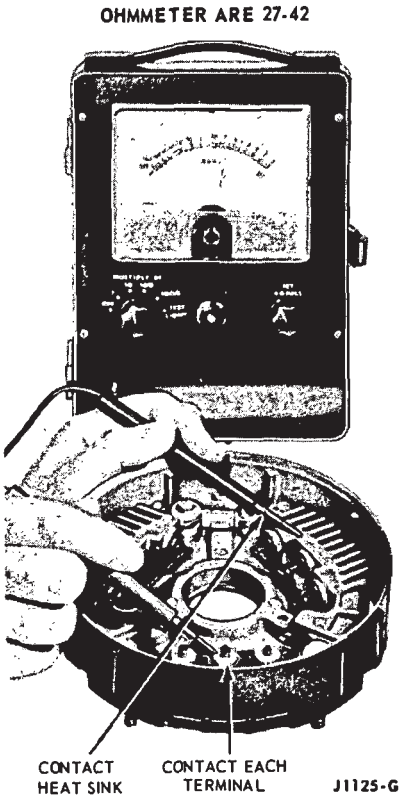


FIG. 2—65-Ampere Leece Neville Diode Test

3 REMOVAL AND INSTALLATION

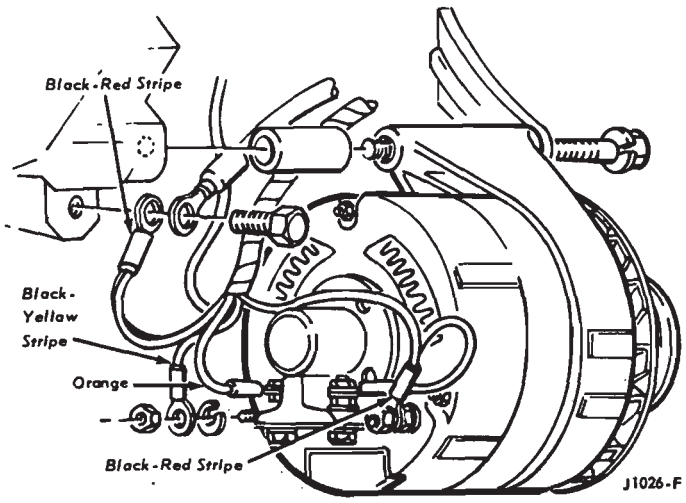


FIG. 3—Alternator Mounting

ALTERNATOR REPLACEMENT

1. Disconnect the battery ground cable.
2. Loosen the mounting bolts and the adjusting arm to alternator bolt, and remove the drive belt.
3. Remove the mounting bolts and the adjusting arm bolt, disconnect the alternator wires and remove the alternator.
4. Connect the alternator wires (Fig. 3), position the alternator in the mounting bracket and install the mounting bolts and adjusting bracket bolt finger-tight.
5. Adjust the belt tension (use tool T63L-8620-A) tighten the mounting bolts, and check the operation of the alternator.

BELT ADJUSTMENT

1. Loosen the alternator mounting bolt to a snug position and loosen the adjusting arm bolts.
2. **Apply pressure on the alternator front housing only** and tighten the adjusting arm to alternator bolt.
3. Check the belt tension using tool T63L-8620-A. Adjust the belt for specified tension (Section 5 in this part).
4. Tighten all mounting bolts.

4 MAJOR REPAIR OPERATIONS—65-AMPERE ALTERNATOR

A disassembled view of the alternator is shown in Fig. 4.

DISASSEMBLY

1. Remove the pulley nut and washer, remove the pulley with a gear puller, and remove the shaft key and spacer.
2. Remove the brushes and terminal insulator, and remove the brush holder assembly from the brush housing.
3. Remove the through bolts and separate the brush end housing and stator assembly from the alternator.
4. Remove the nuts from the three AC terminals. Remove the stator from the housing.
5. Remove the rotor from the front housing using a gear puller or an arbor press, only if the bearing is damaged and must be replaced.
6. Unsolder the field leads from the slip rings, and remove the slip rings and the bearing from the slip ring end of the rotor shaft, only if the bearing is worn or damaged and must be replaced. Use a gear puller. **Use care in removing the slip rings, so as not to damage them. If they are cracked or broken during disassembly, they must be replaced.**
7. Remove the bearing retainer from the front housing and press out the old bearing from the housing, only if the bearing must be replaced.
8. Remove the rectifier assembly mounting bolts, terminals, and insulators and remove the rectifier assemblies. Remove the stator terminal insulator.

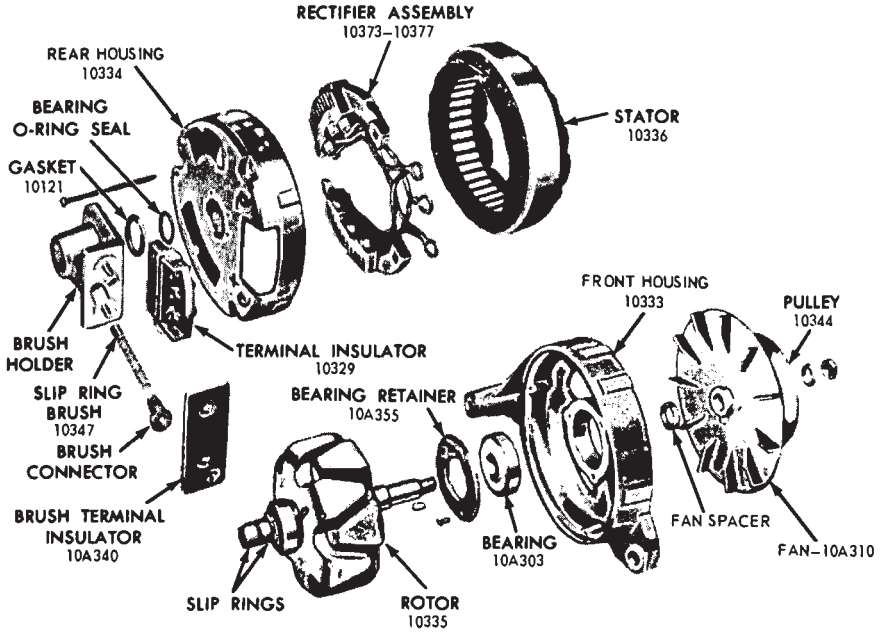


FIG. 4—Disassembled 65-Ampere Leece Neville Alternator

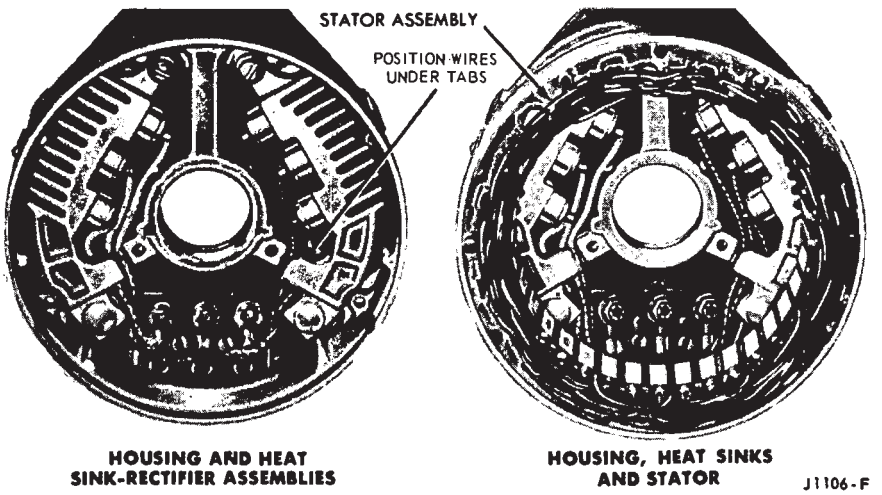


FIG. 5—Rear Housing, Rectifier and Stator Assembly

PARTS REPAIR OR REPLACEMENT

Nicks and scratches may be removed from the rotor slip rings by turning down the slip rings. Remove only enough to clean up the surface. If the slip rings are badly damaged, they should be replaced.

ASSEMBLY

1. Press the new bearing onto the slip-ring end of the rotor shaft. **Put pressure on the inner race only.** Heat the slip rings so that the insulation will not split, carefully press the slip rings on the shaft and solder the field wires to the rings.
2. Press the new bearing into the front housing, and install the bearing retainer. **Put pressure on the outer race only.**
3. Place the slip-ring end of the shaft firmly on a flat plate in an arbor press, and assemble the front housing and bearing on to the drive end of the shaft. **Use a tube or pipe so as to put pressure on the bearing inner race only.**
4. Install the stator insulator. Put the rectifier insulators in position. Place the rectifier assemblies in the housing and install the mounting screws and terminals. Make certain that the rectifier assemblies are insulated from the end frame. Position the three rectifier terminals to the terminal studs. Position the wires under the tabs extending from each heat sink to prevent interference with the rotor (Fig. 5).
5. Place the stator in position (Fig. 5), and line up the housing through-bolt holes to match those in the stator. Position the three stator terminals over the three rectifier terminals, and install the terminal nuts (Fig. 5).

6. Place the rear housing and stator assembly into position over the rotor. Use the housing through bolts to line up the two housings and the stator. Tighten the housing through bolts.

7. Install the brush holder with the O-ring between the holder and the frame (Fig. 4). Place the brushes and springs in the holder with the extruded portion of the brush connectors against the terminal screw shoulders. Hold the brush connectors in position with a machinists steel scale until the terminal insulator is installed. Install the brush terminal insulator, and withdraw the steel scale.

8. Install the fan spacer, shaft key, fan, pulley, and lock washer and nut. Tighten the mounting nut to 40 ft-lbs. torque.

5 SPECIFICATIONS

ALTERNATOR

Supplier	Rating Amperes @ 15V	Rating Watts @ 15V	Field Current Amps @ 12V	Cut-In Speed (Engine rpm)	Rated Output Speed (Engine rpm) Cold	Rated Output Speed (Engine rpm) Hot	Slip-Ring Turning (Inches) Min. Dia.	Slip-Ring Turning (Inches) Max. Runout	Brush Length (Inches) New	Brush Length (Inches) Wear Limit	Pulley Nut Torque (Ft-Lbs)	Belt① Tension (Lbs)
Leece-Neville	65	975	2.9	400	1600	2000	Light Cut	0.002	1/2	9/32	40–50	70–110

①Used Belt. New Belt 140. A used belt is one that has been in operation more than 10 minutes. If belt tension is out of specification, or belt, has been removed, reset to 110 lbs.

CJ1450-A

PART 31-05 Leece Neville Alternator Regulators

COMPONENT INDEX Applies to Ford and Mercury Only		COMPONENT INDEX Applies to Ford and Mercury Only	
ADJUSTMENTS	05-03	TESTING,	
DESCRIPTION AND OPERATION	05-01	Field Relay Test	05-01
REMOVAL AND INSTALLATION	05-03	Voltage Limiter Test	05-01
SPECIFICATIONS	05-04		

A page number indicates that the item is for the vehicle listed at the head of the column.

1 DESCRIPTION AND OPERATION

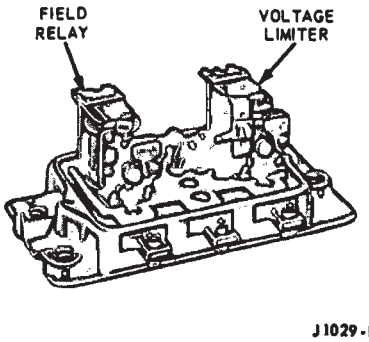


FIG. 1—Leece Neville Alternator Regulator

The alternator regulators are composed of two control units mounted as an assembly (Fig. 1). The units are similar in operation to those used on the standard alternator regulator and consist of a double-contact voltage limiter and a field relay.

The regulator used has three terminals, battery (BAT), ignition (IGN), and field (FLD).

Refer to Wiring Diagram Manual Form 7795P-70 for schematics and locations of wiring harnesses.

FIELD RELAY

The field relay (Fig. 1) is controlled by the ignition switch. The field relay connects the battery to the alternator field through the upper voltage limiter contacts.

VOLTAGE LIMITER

The voltage limiter holds the alternator voltage within a predetermined range by controlling the amount of current supplied to the rotating field. The voltage limiter is temperature compensated.

2 LEECE NEVILLE REGULATOR TESTING

Refer to the Diagnosis Manual for regulator diagnosis procedures. Use the Rotunda ARE 27-38 tester for the following tests:

VOLTAGE LIMITER TEST

Voltage limiter calibration tests must be made with the regulator cover in place and with battery and ignition loads only.

For accurate voltage limiter testing, the battery specific gravity must be at least 1.230. **If the battery is low in charge either charge it to 1.230 specific gravity or substitute a fully charged battery, before making a voltage limiter test.**

To test the voltage regulator on the vehicle, make the test connections to the battery, and tester knob adjustments as shown in Fig. 2 Voltage limiter test. Turn all accessories off, including door operated dome lights. Close the battery adapter switch start the engine, then open the adapter switch. Attach a voltage regulator thermometer to the regulator cover. Operate the engine at approximately 2000 rpm for 15 minutes (use a tachometer).

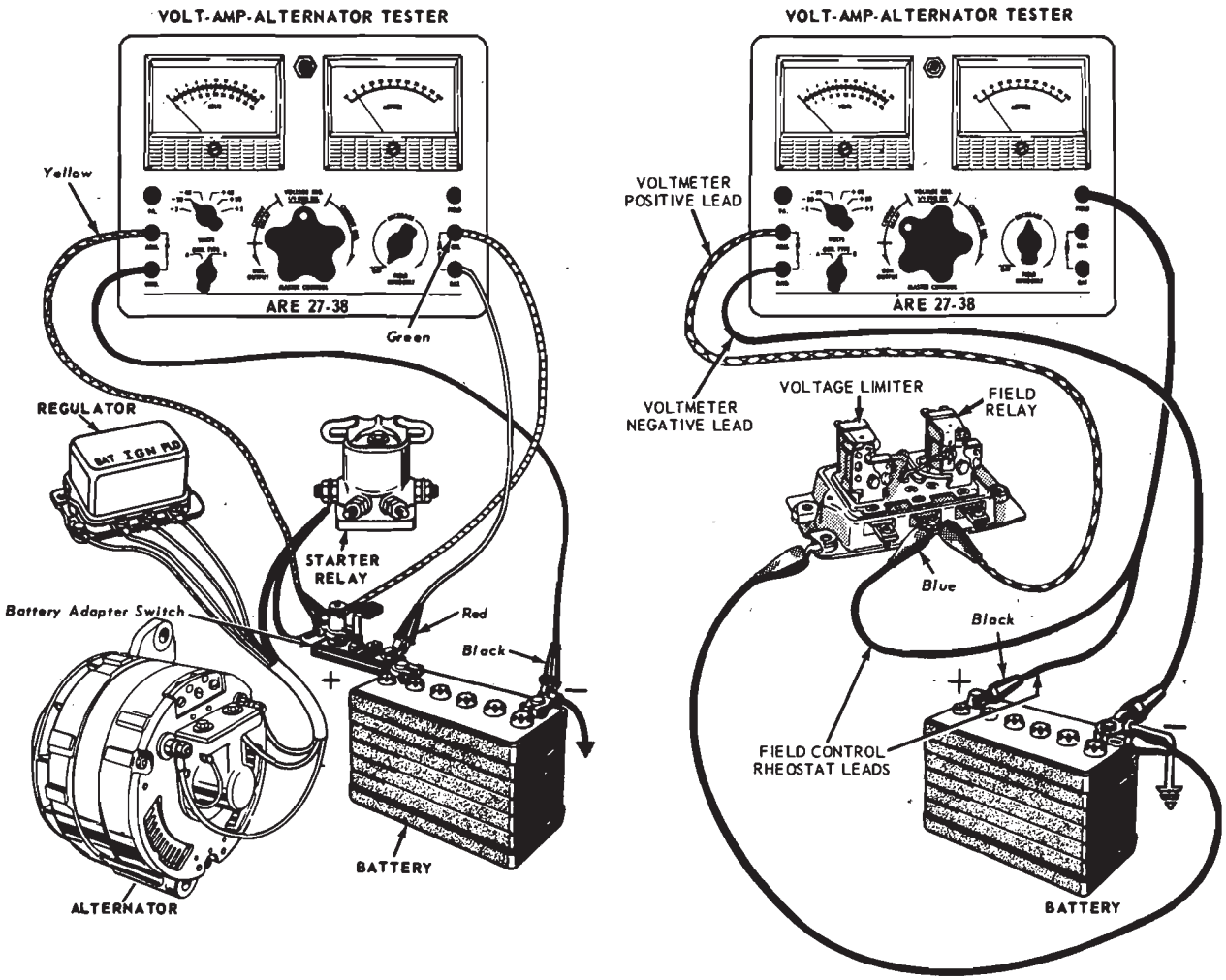
When the battery is charged, and the voltage regulator has been temperature stabilized, the ammeter should indicate less than 10 amperes with the master control set at the 1/4 OHM position.

Cycle the regulator as follows: turn the ignition key to OFF to stop the engine, close the adapter switch, start the engine, and open the adapter switch. Increase the engine speed to 2000 rpm. Allow the battery to normalize for about one minute, then read the voltmeter (upper scale). Read the thermometer, and compare the voltmeter reading with the voltage given in Fig. 3 for the ambient temperature indicated on the thermometer.

If the regulated voltage is not within specifications (Fig. 3), remove the regulator to an alternator regulator test stand and make a voltage limiter adjustment (Section 4 in this part). After each adjustment be sure to cycle the regulator before each reading. **The readings must be made with the cover in place.**

FIELD RELAY TEST

Remove the regulator from the vehicle. Make the connections as shown in Fig. 2 Field Relay Test. Slowly rotate the field rheostat control clockwise from the maximum



VOLTAGE LIMITER TEST

FIELD RELAY TEST

J 1396-C

FIG. 2—Alternator Regulator Test

Ambient Air Temperature °F	Voltage Limiter Setting (Volts)
50	14.1–15.1
75	13.9–14.9
100	13.7–14.7
125	13.6–14.6

FIG. 3—Voltage Limiter Setting Versus Ambient Air Temperature

counterclockwise position until the field relay contacts close. Observe the voltmeter reading at the moment that the relay contacts close. This is the relay closing voltage. If the relay closes immediately, even with the field rheostat knob close to the maximum counterclockwise position, push the red button between the two meters, and repeat the test. If the closing voltage is not to specifications, (Section 5 in this part), adjust the relay (Section 4 in this part).

3 REMOVAL AND INSTALLATION

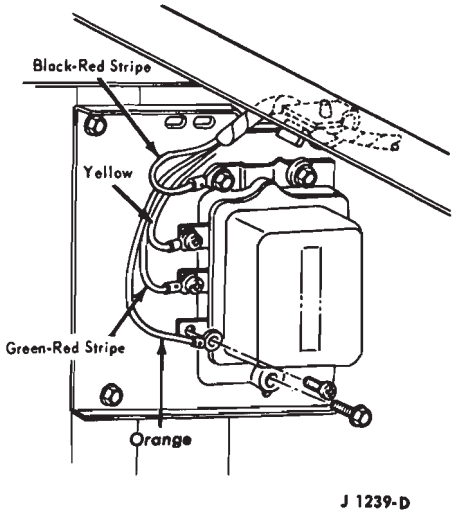


FIG. 4—Regulator Mounting

1. Disconnect the battery ground cable.
2. Remove the wires from the regulator.
3. Remove the regulator mounting screws and the regulator.
4. Position the regulator and install the mounting screws. Mount the black-red stripe ground wire lug under the mounting screw at the ground strap end of the regulator (Fig. 4).
5. Connect the remaining regulator wires (Fig. 4).
6. Connect the battery ground cable and check the regulator operation.

4 REGULATOR ADJUSTMENTS

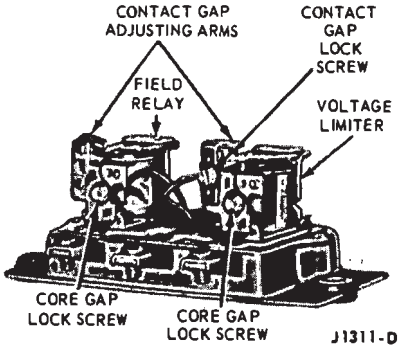


FIG. 5—Regulator Gap Adjustments

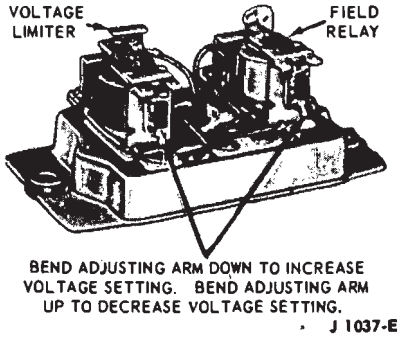


FIG. 6—Regulator Adjustments

Final checking of the regulator must be made with the regulator at normal operating temperature and the cover in place. For any of the adjustments given below, remove the cover by removing the two cover mounting screws.

As the regulator is temperature compensated, be sure to use a voltage regulator thermometer for accurate voltage limiter adjustment.

REGULATOR GAP ADJUSTMENTS

Make the regulator gap adjustments with the regulator removed from the vehicle.

VOLTAGE LIMITER

Adjust the contact gap first. Loosen the contact gap adjusting arm lock screw (Fig. 5), and adjust the contact gap to specification (Section 5 in this part). Tighten the lock screw. Adjust the core gap with the lower contacts closed. Loosen the core gap lock screw and move the contact insulator up or down until the specified core gap is arrived at between the coil core and the armature. Tighten the lock screw.

FIELD RELAY

Adjust the core gap first. Loosen the field relay core gap lock screw and move the contact insulator up or down until the specified core gap is arrived at between the coil core and the armature. Tighten the lock screw. Put the blade of a small screw driver in the field relay adjusting arm slot (Fig. 5), and bend the arm to obtain the specified contact gap (Section 5 in this part).

REGULATOR VOLTAGE ADJUSTMENTS

VOLTAGE LIMITER

To increase the voltage setting, bend the adjusting arm downward. To decrease the voltage setting, bend the adjusting arm upward (Fig. 6). **Before adjusting the voltage, and before making a final voltage reading with the cover in place, cycle the regulator. Reduce the alternator speed to zero and turn the ignition switch to OFF momentarily. This procedure must be repeated each time an adjustment is made.**

FIELD RELAY

The field relay cut-in voltage is increased by bending the adjusting arm downward, or decreased by bending the adjusting arm upward (Fig. 6).

5 SPECIFICATIONS

REGULATOR

Regulator	Current Rating	Voltage Regulation (Volts)		Voltage Limiter		Field Relay		
		Temp °F	Setting	Contact Gap (Inches)	Core Air Gap (Inches)	Contact Gap (Inches)	Core Air Gap (Inches)	Closing Volts
Leece-Neville Ammeter Circuit	Used with 65 Ampere Leece-Neville Alternator	50 75 100 125	14.1-15.1 13.9-14.9 13.7-14.7 13.6-14.6	0.018-0.020 With Lower Contacts Closed	0.042-0.052 With Lower Contacts Closed	0.024-0.026	0.011-0.013 With Contacts Touching	6.2-7.2

CJ1454-A

PART 31-06 Batteries

COMPONENT INDEX Applies to All Models	COMPONENT INDEX Applies to All Models
SPECIFICATIONS ..... 06-02 TESTING With Rotunda Battery-Starter Tester (ARE 16-31) 06-01	With Rotunda Cell Analyzer (SRECA-200) 06-01

A page number indicates that the item is for the vehicle listed at the head of the column.

1 BATTERY TESTS

Tests are made on a battery to determine the state of charge and also the condition. The ultimate result of these tests is to show that the battery is good, needs recharging, or must be replaced.

If a battery has failed, is low in charge, or requires water frequently, good service demands that the reason for this condition be found. It may be necessary to follow trouble shooting procedures to locate the cause of the trouble. Refer to the Ford Car and Truck Diagnosis Manual for battery diagnosis procedures.

Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are brought near the vent openings of the battery. The sulphuric acid in the battery electrolyte can cause a serious burn if spilled on the skin or spattered in the eyes. It should be flushed away with large quantities of clear water.

Particular care should be used when connecting a booster battery in order to prevent sparks. Be certain to connect positive terminal to positive terminal and negative terminal to negative terminal.

Before attempting to test a battery, it is important that it be given a thorough visual examination to determine if it has been damaged. The presence of moisture on the outside of the case and/or low electrolyte level in one or more of the cells are indications of possible battery damage.

The Autolite batteries incorporate a single one-piece cover which completely seals the top of the battery and the individual cell connectors. This cover must not be pierced with test probes to perform individual cell tests.

TESTS USING THE ROTUNDA CELL ANALYZER (SRECA-200)

The Rotunda Cell Analyzer (SRECA-200) measures the individual cell voltages by inserting probes into the cell openings. Follow the instructions that come with the unit.

A battery can also be tested by determining its ability to deliver current. This may be determined by conducting a Battery Capacity Test. Fig. 1 shows the battery capacity test in outline form.

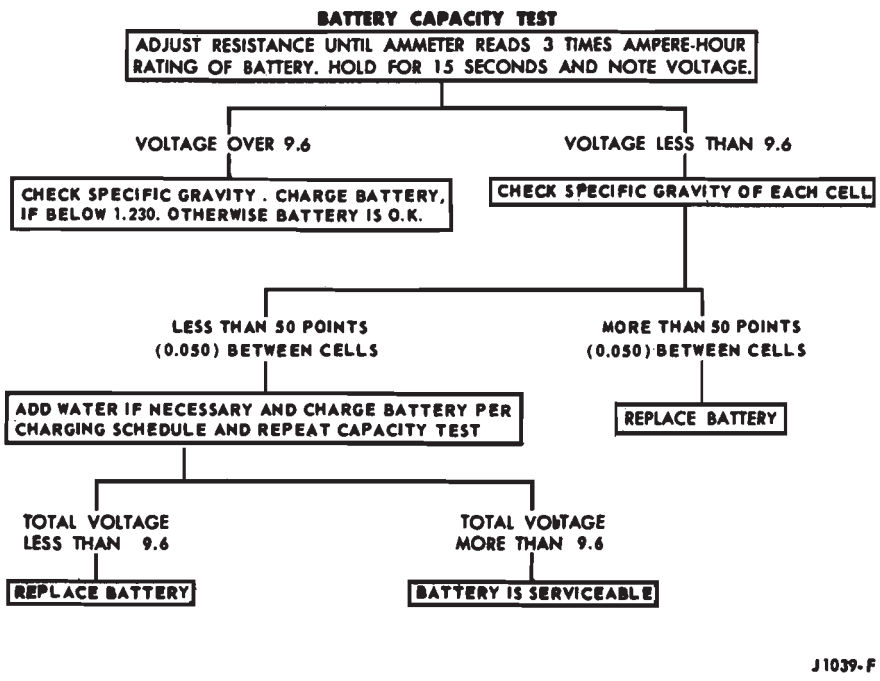


FIG. 1—Battery Capacity Test Outline

TESTS USING THE ROTUNDA BATTERY-STARTER TESTER ARE 16-31

BATTERY CAPACITY TEST

A high rate discharge tester (Rotunda Battery-Starter Tester ARE 16-31), in conjunction with a voltmeter is used for this test.

1. Turn the control knob on the Battery-Starter Tester to the OFF position.
2. Turn the voltmeter selector switch to the 20-volt position.
3. Connect both positive test leads to the positive battery post and both negative test leads to the negative battery post. **The voltmeter clips must contact the battery posts and not the high rate discharge tester clips. Unless this is done the actual battery terminal voltage will not be indicated.**
4. Turn the load control knob in a clockwise direction until the ammeter reads three times the ampere hour rating of the battery. (A 45 ampere-hour battery should be tested at 135 amperes load).
5. With the ammeter reading the

Specific Gravity Reading	Charge Rate Amperes	Battery Capacity – Ampere Hours				
		45	55	70	80	85
1.125–1.150 ①	35	65 min.	80 min.	100 min.	115 min.	125 min.
1.150–1.175	35	50 min.	65 min.	80 min.	95 min.	105 min.
1.175–1.200	35	40 min.	50 min.	60 min.	70 min.	75 min.
1.200–1.225	35	30 min.	35 min.	45 min.	50 min.	55 min.
Above 1.225	5	②	②	②	②	②

① If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80° F.

② Charge at 5 ampere rate only until the specific gravity reaches 1.250 at 80° F.

At no time during the charging operation should the electrolyte temperature exceed 130° F.

J 1355-C

FIG. 2—Allowable Battery High Rate Charge Time Schedule

required load for 15 seconds, note the voltmeter reading. **Avoid leaving the high discharge load on the battery for periods longer than 15 seconds.**

6. If the voltmeter reading is 9.6 volts or more, the battery has good output capacity and will readily accept a charge, if required. Check the specific gravity. If the specific gravity reading is 1.230 or below, add water if necessary and charge the battery until it is fully charged (Fig. 1). **Always disconnect the battery ground cable when charging the battery.**

The battery is fully charged when the cells are all gassing freely and the specific gravity ceases to rise for three successive readings taken at hourly intervals. Additional battery testing will not be necessary after the battery has been properly charged.

7. If the voltage reading obtained during the capacity test is below 9.6 volts, check the specific gravity of each cell.

8. If the difference between any two cells is more than 50 points (0.050), the battery is not satisfactory for service and should be replaced.

9. If the difference between cells is less than 50 points (0.050), the battery should be charged according to the charging schedule in Fig. 2. In some cases the electrolyte level may be too low to obtain a specific gravity reading. In such cases water should be added until the electrolyte level just covers the ring in the filler well, then charge the battery at 35 amperes for the maximum charging time indicated in Fig. 2 for the capacity of the battery being tested.

10. After the battery has been charged, repeat the capacity test. If the capacity test battery voltage is still less than 9.6 volts, replace the battery. If the voltage is 9.6 volts or more, the battery is satisfactory for service.

11. If the battery is found to be discharged only, check for a loose fan belt, loose electrical connections and charging system performance.

2 SPECIFICATIONS

BATTERIES

Allowable Battery High Rate Charge Time Schedule						
Specific Gravity Reading	Charge Rate Amperes	Battery Capacity–Ampere Hours				
		45	55	70	80	85
1.125–1.150①	35	65 min.	80 min.	100 min.	115 min.	125 min.
1.150–1.175	35	50 min.	65 min.	80 min.	95 min.	105 min.
1.175–1.200	35	40 min.	50 min.	60 min.	70 min.	75 min.
1.200–1.225	35	30 min.	35 min.	45 min.	50 min.	55 min.
Above 1.225	5	②	②	②	②	②

①If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80° F.

②Charge at 5 ampere rate only until the specific gravity reaches 1.250 at 80° F.
At no time during the charging operation should the electrolyte temperature exceed 130° F.

Battery Freezing Temperatures			
Specific Gravity	Freezing Temp	Specific Gravity	Freezing Temp
1.280	–90°F	1.150	+5°F
1.250	–62°F	1.100	+19°F
1.200	–16°F	1.050	+27°F

Battery Ampere Hours		Number Of Plates
45		54
55		66
70		66
80		78

CJ1447-A